Jeffrey Energy Center
Unit 2
Compliance Assurance Monitoring & PM CEMS Correlation
Test Protocol

Prepared for

Westar Energy, Inc.
122 South West 2nd Street
Topeka, KS 66601

Prepared by

RMB Consulting & Research, Inc.
5104 Bur Oak Circle
Raleigh, North Carolina 27612

May 12, 2011

1.0 INTRODUCTION

On January 25, 2010, Westar Energy, Inc. (Westar) entered into a Consent Decree (Civil Action No. 09-CV-2059) with the United States Federal Government. Among other requirements for the Jeffrey Energy Center (JEC), the Consent Decree requires that Westar use its Compliance Assurance Monitoring (CAM) Plans for JEC Units 1 – 3 to provide ongoing reasonable assurance of compliance with the particulate matter emission (PM) limit for each unit. The Consent Decree also requires Westar to install, certify and operate a PM continuous emission monitoring system (PM CEMS) on one JEC unit. Westar has chosen to install a PM CEMS on Unit 2. Consistent with the Consent Decree, the Unit 2 PM CEMS will not be used to determine compliance with the PM emission limit. Additionally, Paragraphs 83, 85 and 87 of the Consent Decree require Westar to conduct PM stack testing to demonstrate compliance with the PM emission limits.

The purpose of this test program is to:

(1) develop a CAM Plan specific to Unit 2,

(2) perform the PM correlation testing required to certify the PM CEMS in accordance with Performance Specification 11 (PS-11) in Appendix B of 40 CFR Part 60,

(3) conduct the PM compliance testing required in Paragraphs 83, 85 and 87 of the Consent Decree. A separate compliance test protocol will be submitted for this testing.

Prior to entering into the Consent Decree agreement, the PM emission limit for JEC Units 1 – 3 was 0.10 lb/mmBtu and the CAM for each unit had been established in accordance with the requirements specified in 40 CFR Part 64 (i.e., the CAM Rule). Additional CAM testing was conducted for Units 1 and 3 in August 2010 to establish CAM for the new Consent Decree PM emission limit. These CAM Plans were submitted to KDHE as part of the September 2010 Title V significant modification application. As a reminder, Westar planned to rebuild the electrostatic precipitator (ESP) on JEC Unit 2 beginning early 2011. On June 16, 2010, USEPA Region 7 approved Westar's request to delay Unit 2 CAM testing until the Unit 2 ESP modifications were completed. To comply with the Consent Decree, Westar must now refine the Unit 2 CAM in order to ensure compliance with the new Consent Decree PM emission limit of 0.03 lb/mmBtu.

Unit 2 is a tangentially-fired boiler which burns low sulfur, subbituminous coal as the primary fuel and Number 2 fuel oil for unit start-up and flame stabilization. PM emissions are controlled by two ESPs arranged in a parallel flow configuration, located downstream of the air preheater ("cold-side"). Each ESP consists of two bus sections with nine left side collecting plates (TR-sets) and nine right side collecting plates per bus section (i.e., 18 TR-sets per bus section, 36 TR-sets per ESP and 72 TR-set total for Unit 2). Because collecting plate spacing is uniform, this configuration results in four "gas paths" within each ESP – eight total. Emissions from Unit 2 are discharged through a dedicated stack. Unit 2 is also equipped with a gas desulfurization (FGD) system for sulfur dioxide (SO_2) control. The FGD system is a wet, spray tower design that contains four scrubber modules with two slurry pumps per module. The unit does not have ESP or FGD bypass capability.

Attachment A of this test protocol provides information for the proposed source test plan as well as information regarding the test contractor.

2.0 CAM TEST SUMMARY

The Table 2 – 1 presents a summary of the tentative schedule and test conditions. The preliminary results of each test will be used to assist in the determination of the test conditions for the subsequent tests.

Table 2 - 1. Test Program Conditions and Schedule

Preliminary Conditions and Test Schedule Westar Jeffrey Energy Center Topeka, Kansas				
Unit	**Condition**	**Date mm/dd/yy**	**Load (MW)**	**Duration* (hour)**
2	Baseline	06/16/11	720+	10
	8 Pumps online, ESP De-tune Condition 1	06/17/11	720+	6
	8 Pumps online, ESP De-tune Condition 2	06/17/11	720+	7
	6 Pumps, ESP De-tune Condition 3	06/20/11	720+	6
	4 Pumps, ESP De-tune Condition 4	06/21/11	720+	7
	8 Pumps, Low-load Condition #1	06/21/11**	450-600	7
	8 Pumps, Low-load Condition #2	06/22/11**	300-450	6

* These are estimated times and do not include any delays that might occur due to process problems, test equipment problems, weather delays, etc. The time required for de-tuning and process stabilization may vary, but should take about one hour per condition. Approximately 5.5 hours of testing will be required per condition – assuming there are no delays.

** During the baseline test condition, three (3) two-hour test runs will be conducted. Data collected from these 3 test runs will be used for (1) CAM development, (2) PM CEMS correlation development and (3) Consent Decree PM compliance demonstration.

*** Exact low-load conditions will need to be finalized with the plant. This testing may need to be performed at night and/or early morning. Testing at night may result in a shift in the test schedule of up to 24 hour.

During the baseline test condition, three (3) two-hour test runs will be conducted (also reference Section 5 of this test protocol). During each of the three test runs, filterable and condensable PM testing will be conducted in accordance with Reference Methods 5B and 202, respectively. Data collected from the three baseline tests will be used for CAM development, PM CEMS correlation development and Consent Decree compliance determination. The remaining CAM/PM correlation tests will be conducted for filterable PM, only, using 90 minute test runs.

The actual number of tests will depend on the test results (e.g., depending on the FGD de-tuned tests, it may not be necessary to conduct an ESP de-tuned test at that condition). Boiler operating data, ESP operating data, and FGD operating data will be collected simultaneously with each test (*see Section 2.3, Data Requirements, for specific parameters*).

The particulate test team will setup on the Monday preceding the start of the testing. The stack test crews should have all their equipment setup and have completed any preliminary testing (i.e. stratification testing) so that they are ready to begin PM compliance testing on Tuesday morning. RMB personnel will travel on Monday and arrive at the plant Tuesday morning. A brief, pre-test meeting will be conducted Tuesday morning at 8:00 A.M. This meeting will include the stack test crews, ESP technician(s), and possibly operations supervisors. The purpose of the meeting is to answer any questions that may arise and make sure all affected parties are aware of the test format and their specific roles during the testing.

Testing on Unit 2 will tentatively start on Thursday (June 16, 2011) immediately following the PM compliance testing on Units 1 and 3 (June 14 and 15, 2011). The test crew(s) should be prepared to begin testing at about 8:00 A.M each day with the exception of the low-load tests. The actual test schedule will be finalized on site. Each test condition is expected to last 5-6 hours, although additional runs may be required to address operational upsets or questionable test results. Once a test condition is completed and RMB has determined that the test data is satisfactory, testing will proceed with the next test condition.

After the baseline testing, RMB will setup the FGD and ESP for the next de-tuned test condition. It is anticipated that this task will require an additional 1-2 hours prior to the start of the next test condition. Test crew(s) will be instructed to begin taking data once RMB has determined that the FGD and ESP setup is satisfactory and stable operating conditions have been achieved. No test data will be taken during the FGD and ESP setup process.

2.1 Test Procedure Summary

Sampling will be performed in accordance with the U.S. Environmental Protection Agency Reference Methods 1, 2, 3A, 4, and 5B, as published in the Title 40, *Code of Federal Regulations,* Part 60, Appendix A. All testing will be conducted on the Unit 2 stack using the existing sampling ports. All measurements will include filterable-only particulate. Attachment A to this protocol provides descriptions of all the test procedures required to complete this program (including procedures for the compliance testing), a list of relevant calculations and example test data sheets.

Each test condition will consist of three test runs, if possible. The result of a test will be the average of three runs. It should be emphasized that measurement accuracy is very important; therefore, more than three runs may be required to obtain accurate and consistent results.

Prior to field testing, all instruments will be checked and calibrated prior to coming to site. The number of sampling points and positions of the points in the flue at the sampling locations(s), and the sampling time at each point will be determined onsite prior to the particulate testing. Preliminary temperature and velocity traverse, monitor analysis of a bag sample, and calculations will be performed to determine a correct nozzle and orifice size

The sampling train will be prepared in part at the sampling location(s), before each test run. The probe will be marked with glass-cloth tape at increments that corresponded with the predetermined sampling point positions in the flue. For test runs that will also be used to determine PM compliance, a USEPA Method 202 impinger assembly will be prepared and added to the train. All incline manometers will be checked and zeroed. Each entire sampling train assembly will be leak-checked at 15 inches of water vacuum for one minute and the leakage rate recorded. A leakage rate less than 0.02 cfm will be considered acceptable. The sampling procedures will be performed in accordance with the Environmental Protection Agency's Reference Method 5B, "Determination of Non-sulfuric Acid Particulate Matter Emissions from Stationary Sources " as published in the "Standards of Performance for New Stationary Sources," and subsequent revisions in the Title 40, *Code of Federal Regulations,* Part 60, Appendix A.

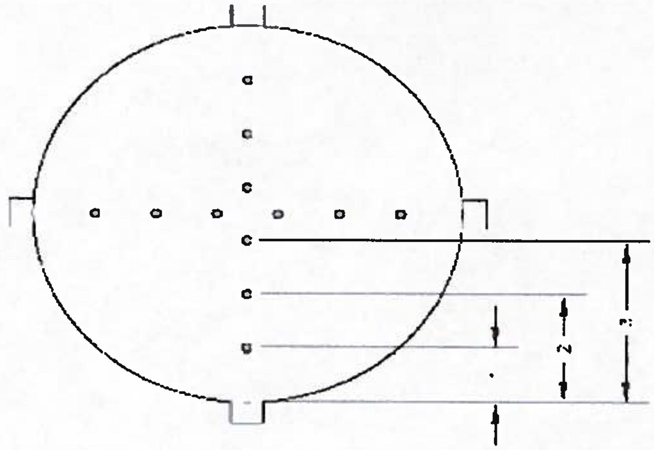
Three test runs will be performed at the stack sampling location for Unit 2. A total of 12 points (three points from each of the four sampling ports in the stack) will be sampled. Except for the compliance test (baseline condition) which is two hours, each point will be sampled for a period of seven and a half minutes at a calculated isokinetic sampling rate. The total sampling time will be ninety (90) minutes. The sampling data for each test run will be recorded on a field test form during each sampling period.

After the completion of a test run, a final leak-check will be performed at the highest vacuum experienced during the sampling run, for one minute and the leakage rate recorded. A leak rate of not more than 0.02 actual cubic feet per minute (acfm) or 4% of the average sample flow during the test run, whichever is less, will be considered acceptable per the method.

The sampling nozzle and probe will be capped and taken to a clean area for sample recovery. At the recovery area, the filter will be carefully removed from the filter holder and transferred to its petri dish for baking, desiccation and weighing. The sampling nozzle, probe liner and filter holder inlet will be rinsed with high purity acetone. The acetone washing and an acetone blank will be collected in appropriately labeled amber glass sample bottles and retained for later evaporation, desiccation, and weighing. Flue gas concentrations (percent CO_2 and O_2) will be determined by taking the integrated gas sampling train and performing an instrumental analysis of the gas that was collected, simultaneously, with the particulate sampling. The integrated gas sample will be collected from the discharge of the particulate control unit. The CO_2 and O_2 concentrations for each test run will be recorded on a field test form. For the compliance tests, the back-half of the Method 5B sampling train (Method 202) will be purged with nitrogen and recovered as described in Attachment A.

The flue gas moisture collected in the first three impingers will be measured and recorded. The moisture laden silica gel in the fourth impinger will be weighed. The weight gain of the silica gel will be added to the measured moisture condensed during the test run to determine the total moisture collected for that run.

After the field testing will be completed, the silica gel, filters, filter blank, acetone washings, and acetone blank(s) from the test runs will be analyzed by Civil & Environmental Consultants, Inc. The analytical procedures will be performed in accordance with Reference Method 5B to obtain preliminary results in the field. Preliminary measurements will be taken onsite to assist in the determination of the next operating condition to be measured.



Traverse Point	Distance % of Diameter	Distance from inside wall	Distance from outside of port
1	4.4	15.1	2[illegible].1
2	14.8	50.[illegible]	58.1
3	29.6	101.6	107.6

Stack Diameter	343.35 inches
Stack Area	643.00 square feet
Number of test ports available	4 ports
Length of test ports	6 inches
Diameter of test ports	4 inches
Height – grating to test port	48 inches

Comments

CEC

Civil & Environmental Consultants, Inc.

4848 Park 370 Blvd., Suite F – Hazelwood, MO 63042

314-656-4566 · 866-250-3679

www.cecinc.com

Westar Energy
Jeffrey Energy Center Unit 1
CAM Test
Stack Location Test Points

EXHIBIT

DRAWN BY: PLR:CAC	CHECKED BY:	FMS	APPROVED BY:	FMS*	FIGURE NO.:	1
DATE: JUNE 2010	DWG SCALE:	N.T.S.	PROJECT NO:	101-026		

Each filter and beaker will be oven dried at 320 °F for one to two hours, cooled in a desiccator for a half hour before weighing, and weighed for determining a preliminary weight. The filters and beakers will be taken back to the lab and baked at 320 °F for the remainder of the six hours required by the method. They will be transferred back to the desiccator for two to three hours to obtain an official weight and then weighed every six hours, minimum, until two consecutive weights within ±0.1 milligram are obtained.

An acetone blank collected will be used to determine the amount of residual weight each beaker retained due to acetone impurities. Each filter, acetone washing and acetone blank will be individually weighed on an analytical balance with a sensitivity of 0.1 milligram.

2.2 Boiler Operation

Each CAM test will be conducted with the boiler operated at normal, full load while firing representative coal. For JEC Unit 2, normal, full operating load will generate the highest level of particulate mass emissions and produce conservative indicator ranges. For the purposes of this testing, Westar will conduct most of the tests at a gross unit load of 720 MW or greater. This load represents 90% of the maximum gross load defined under the Acid Rain Program and also represents the load conditions during the previous CAM test program. However, some low-load tests will be performed to determine if higher L/G ratios are acceptable at lower loads. Note that an upper L/G limit was previously imposed by EPA based on high-load tests, only. Westar believes that this upper limit should only apply at higher gas velocities (i.e., higher loads) which may cause demister carryover issues. Westar realizes that tests were never performed at lower loads to support its belief, but intends to conduct such test during this program.

For Unit 2, load should be brought to normal, full load each morning at least two hours prior to the start of testing (or de-tuning) for those boilers being tested that day. This allows the boiler, ESP, and FGD to achieve steady-state conditions prior to testing (or de-tuning). At present, it is anticipated that testing will start at 8 A.M. each morning so the unit(s) should be at full load by 6 a.m. It is anticipated that unit load should be maintained, if possible, until approximately 9 - 10 P.M. or until testing is completed.

Boiler operation should be maintained as steady as possible during the entire test period. Since testing will be conducted for each unit on multiple days, it is important that boiler operation and load be as similar as possible between each test. This will help to ensure the development of an accurate relationship between FGD operating conditions and particulate mass emissions, which is the ultimate goal of this testing. All other soot blowing can continue as normal. If any boiler-related problems should develop during testing, RMB would like to be notified as soon as possible to suspend testing or adjust the test conditions.

Although we anticipate that USEPA Region 7 and KDHE will grant Westar a variance for excess emissions during the CAM testing, care will be taken to keep emissions within reasonable levels during testing.

2.3 CAM Data Requirements

Various coal, ash, boiler, ESP, and FGD operating data will be collected during each test. This data will be used to evaluate operations stability and for subsequent day setup.

Boiler and FGD operating data will be collected continuously during each test. Automated data collection is preferable; however, at JEC, some data may be manually recorded. ESP data should include primary and secondary voltages and currents. ESP data will be collected manually from the ESP control room computer. All ESP data will be collected, at a minimum, every hour during testing. ESP power data will also be collected prior to and during the ESP setup, as needed, for the ESP de-tuned test conditions. Continuous emission monitoring systems (CEMS) data will include emissions data, stack temperature and flow. All CEMS data should be collected at least every hour and Westar should also note any variation between the CEMS and plant distributive control system (DCS) clock time. Table 2-2 provides a list of the specific boiler and ESP data that should be recorded during each test condition.

Table 2 - 2. CAM Operating Data

Unit Data	Stack Data	FGD Data	ESP Data (each TR Set)
Gross Unit Load Total Air Flow Total Fuel Flow Total Steam Flow Excess O_2 SH Temp. RH Temp. SH Spray RG Spray AH Gas Out Temp.	Stack Flow Stack NO_X Stack SO_2 Stack CO_2 Stack Temp.	Modules in service Pumps in service Slurry inlet pressures (for each pump) Absorber inlet ΔP Demister inlet ΔP Demister outlet ΔP Slurry densities Slurry pH	Primary Voltage Primary Current Secondary Voltage Secondary Current Spark Rate

At least one representative coal and flyash sample will be taken for each day of testing for each unit. Flyash samples should be collected using the standard collection procedure that the plant uses to determine boiler loss on ignition (LOI). For consistency and to the extent possible, all samples will be taken from the same hoppers each day. The samples will be collected by the plant and placed in labeled, sealed containers. Westar will be responsible for submitting the samples for laboratory analysis, if required. Coal analyses may include proximate and ultimate analyses. Flyash analyses may include a standard ash mineral analysis.[1]

[1] The ash components of interest are as follows: Li_2O, Na_2O, K_2O, MgO, CaO, Fe_2O_3, Al_2O_3, SiO_2, TiO_2, P_2O_5, and SO_3.

3.0 PM CEMS CORRELATION TEST SUMMARY

Westar installed a SICK FWE 200 in-situ light scattering PM CEMS on the Unit 2 stack at the same elevation as the existing stack sampling location. The Unit 2 PM CEMS initial correlation testing will be conducted in accordance PS-11 in Appendix B of 40 CFR Part 60.

Sampling will be performed in accordance with the U.S. Environmental Protection Agency Reference Method 5B, as published in the Title 40, *Code of Federal Regulations,* Part 60, Appendix A. Reference Section 2.1 of this protocol for a more detailed description of the Method 5B sampling procedures. All testing will be conducted on the Unit 2 stack using the existing sampling ports. All measurements will include filterable-only particulate. Unit 2 will combust coal during the correlation testing. The unit load, in terms of megawatts (MW), for Unit 2 will be collected during the correlation testing.

The correlation test will consist of performing a minimum of 15 test runs at three (3) PM concentration levels. Each test run will be 90 minutes in length with the exception of the three (3) baseline tests which will be 120 minutes in length. A minimum of three (3) test runs will be performed in each of the PM concentration levels, which are defined as follows:

- Level 1 (Low): Zero to 50 percent of the maximum PM concentration,
- Level 2 (Mid): 25 to 75 percent of the maximum PM concentration, and
- Level 3 (High): 50 to 100 percent of the maximum PM concentration.

JEC operations personnel will specify the manner in which the unit will be operated to achieve the varying PM concentration levels. The anticipated test conditions for this correlation testing are listed in Table 2-1 above. The maximum PM concentration will be defined during the correlation test-planning period.

During the correlation testing, the RM 5B particulate traverses will be coordinated (i.e., sampling start and stop times at each test port) with the operation of the source PM monitor. The RM 5B PM concentration data will be paired with the corresponding source PM monitor outputs in order to develop a correlation curve for the source PM monitor. The correlation data for the source PM monitor must meet following performance criteria:

- For a low-emitting source (i.e., daily average emissions less than 50 % of the emission limit) a correlation coefficient greater than or equal to 0.75.

- 95 percent confidence interval half range:
  - For linear or logarithmic correlation, the mean source PM CEMS response value must be within 10 percent of the PM emission limit value,

- For polynomial correlation, the minimum value for the predicted PM concentration must be within 10 percent of the PM emission limit value, or

- For exponential or power correlation, the median PM CEMS response value must be within 10 percent of the natural logarithm of the PM emission limit value.

- The tolerance interval half range:
  - For linear or logarithmic correlation, the mean PM CEMS response value must have 95 percent confidence that 75 percent of all possible values are within 25 percent of the PM emission limit value,

  - For polynomial correlation, the PM CEMS response value that corresponds to the minimum value for the predicted PM concentration must have 95 percent confidence that 75 percent of all possible values are within 25 percent of the PM emission limit value, or

  - For exponential or power correlation, the median PM CEMS response value must have 95 percent confidence that 75 percent of all possible values are within 25 percent of the natural logarithm of the PM emission limit value.

The PM correlation data will be evaluated using the procedures in Section 12.3 of PS-11. The correlation data must contain a minimum of 15 data points, but there is no maximum to the number of data points that can be used to develop the correlation curve. If more than 15 test runs are performed as part of the correlation test, then up to five (5) test runs may be excluded from the calculations for determining the correlation curve without any explanation. However, if more than five (5) test runs are rejected, then an explicit reason will be stated. All test data, including rejected test runs, will be reported.

The PM concentration in units of mg/acm @ stack conditions will be calculated using the following equation:

$$C_{PM} = \left(\frac{m_5}{V_m}\right) \times \left(\frac{T_m + 460}{T_s + 460}\right) \times \left(\frac{P_s}{P_m}\right) \times \left(1 - \frac{\%H_2O}{100}\right)$$

Where:

C_{PM}		= PM concentration @ stack temperature
m_5		= Total particulate matter catch from RM 5B (mg)
V_m		= Volume of gas sample (dcm)
T_m		= Average dry gas meter temperature (°F)
T_s		= Average stack temperature (°F)
P_s		= Stack pressure (in. Hg)
P_m		= Dry gas meter pressure (in. Hg)

$\%H_2O$ = Percent moisture in stack gas (%)

4.0 PROJECT COORDINATION

Mr. Russell Berry of RMB will supervise the test program. RMB will be responsible for interfacing with the stack testers and plant personnel to address any issues that arise during the course of testing.

The testing firm selected by Westar for this testing will be Civil & Environmental Consulting, Inc. (CEC). Westar will be responsible for collecting all necessary ESP, CEMS, and boiler operating data during the test program. Westar will also be conducting all coal and ash sampling and will be responsible for having these samples submitted to a laboratory for analysis, if necessary. Mr. Dan Wilkus will be the primary Westar contact for regarding test-related issues. If there are any questions regarding this test plan, Dan Wilkus should be contacted directly at 785-575-1614.

ATTACHMENT A

CEC TEST PLAN & TEST CONTRACTOR INFORMATION

COMPLIANCE ASSURANCE MONITORING (CAM) SAMPLING AND PARTICULATE MATTER CONTINUOUS EMISSION MONITOR CORRELATION SAMPLING PROTOCOL

WESTAR ENERGY INC.
JEFFREY ENERGY CENTER
TOPEKA, KANSAS
UNIT 2

Prepared For:

WESTAR ENERGY

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC
HAZELWOOD, MISSOURI 63042

CEC Project 110-266

May 12, 2011

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

Three coal-fired boilers located at Westar Energy's (Westar's) Jeffrey Energy Center (Jeffrey) have been identified as affected units for particulate mass (PM) emissions under 40 CFR Part 64, i.e., the Compliance Assurance Monitoring Rule (CAM). The rule requires affected sources to provide the state permitting authority with a CAM protocol outlining how the source will comply with the rule's requirements (40 CFR 64, §64.4(b)). On January 25, 2010, Westar Energy, Inc. (Westar) entered into a Consent Decree (Civil Action No. 09-CV-2059) with the United States Federal Government. Among other requirements for the Jeffrey Energy Center (JEC), the Consent Decree requires that Westar use its CAM Plans for JEC Units to provide ongoing reasonable assurance of compliance with the particulate matter emission (PM) limit for each unit.

The Consent Decree also requires Westar to install, certify and operate a PM continuous emission monitoring system (PM CEMS) on one JEC unit. Westar has chosen to install a PM CEMS on Unit 2. Consistent with the Consent Decree, the Unit 2 PM CEMS will not be used to determine compliance with the PM emission limit. Additionally, Paragraphs 83, 85 and 87 of the Consent Decree require Westar to conduct PM stack testing to demonstrate compliance with the PM emission limits.

The purpose of this test program is to:

1) Develop a CAM Plan specific to Unit 2,
2) Perform the PM correlation testing required to certify the PM CEMS in accordance with Performance Specification 11 (PS-11) in Appendix B of 40 CFR Part 60,

The two test programs have been combined into a single test series since identical test methods will be utilized for both programs and the process operating scenarios overlap.

Prior to entering into the Consent Decree agreement, the PM emission limit for JEC Units 1 – 3 was 0.10 lb/mmBtu and the CAM for each unit had been established in accordance with the requirements specified in 40 CFR Part 64 (i.e., the CAM Rule). Additional CAM testing was conducted for Units 1 and 3 in August 2010 to establish CAM for the new Consent Decree PM emission limit. These CAM Plans were submitted to KDHE as part of the September 2010 Title V significant modification application. CAM testing for Unit 2 was not conducted at this time, as Westar had planned to rebuild the electrostatic precipitator (ESP) on JEC Unit 2 beginning in early 2011. On June 16, 2010, USEPA Region 7 approved Westar's request to delay Unit 2 CAM testing until the Unit 2 ESP modifications were completed. To comply with the Consent Decree, Westar must now refine the Unit 2 CAM in order to ensure compliance with the new Consent Decree PM emission limit of 0.03 lb/mmBtu.

Unit 2 is a tangentially-fired boiler which burns low sulfur, sub-bituminous coal as the primary fuel and Number 2 fuel oil for unit start-up and flame stabilization. Particulate matter emissions are controlled by two ESPs arranged in a parallel flow configuration, located downstream of the air pre-heater ("cold-side"). Each ESP consists of two bus sections with nine left side collecting plates (TR-sets) and nine right side collecting plates per bus section (i.e., 18 TR-sets per bus section, 36 TR-sets per ESP and 72 TR-set total for Unit 2).

The collecting plate spacing is uniform, this configuration results in four "gas paths" within each ESP – eight total. Emissions from Unit 2 are discharged through a dedicated stack. Unit 2 is also equipped with a gas desulfurization (FGD) system for sulfur dioxide (SO_2) control. The FGD system is a wet, spray tower design that contains four scrubber modules with two slurry pumps per module. The unit does not have ESP or FGD bypass capability.

This document presents the test protocol for the CAM/PM CEMS correlation tests to be conducted for Westar at their Jeffrey Energy Center, Kansas – Unit 2. The emissions testing will be conducted to determine the concentration and emission rates of particulate (TSP) at various operating scenarios. The CAM/PM CEMS correlation tests will be conducted by Civil & Environmental Consulting, Inc. (CEC) whose main office for emission, measurements is located at 4848 Park 370 Blvd, Suite F, Hazelwood, Missouri 63042. Sampling will be performed in accordance with the U.S. Environmental Protection Agency Reference Methods 1, 2, 3A, 4, 5B, and 202 (baseline only) as published in the Title 40, *Code of Federal Regulations,* Part 60, Appendix A. Three test runs at seven planned unit conditions will be performed on Unit 2.

2.0 TEST PROGRAM

The CAM/PM CEMS correlation testing will be conducted in order to determine the operating conditions that will provide a reasonable assurance of compliance with the permit limit. In order to determine the appropriate range of FGD liquid to gas ratios and minimum number and configuration of transformer-rectifier sets (TR-sets) in service to ensure compliance with the PM emission limit, filterable particulate testing will be conducted on Unit 2 at the stack, under multiple test conditions. An initial, baseline test will be conducted on Unit 2 to determine the particulate mass loading during normal boiler and ESP/FGD operation. Please note, condensable PM testing will be conducted at the same time as the filterable testing, however the condensable PM test results shall not be used for the purpose of determining compliance with the Consent Decree PM emission rates (paragraph 87 of the Consent Decree). Additional tests will then be conducted on Unit 2 at varying degrees of PM emissions by removing FGD pumps from service ("FGD de-tuning") and by removing power from the ESP ("ESP de-tuning"). Table 1 presents a summary of the tentatively schedule conditions. The preliminary results of each test will be used to assist in the determination of the test conditions for the next test.

Preliminary Conditions and Test Schedule
Westar Jefferies Energy Center
St. Marys, Kansas

Unit	Condition	Date mm/dd/yy	Load (MW)	Duration* (hour)
2	Baseline	06/16/11	720+	10
	8 Pumps online, ESP De-tune Condition 1	06/17/11	720+	6
	8 Pumps online, ESP De-tune Condition 2	06/17/11	720+	7
	6 Pumps, ESP De-tune Condition 3	06/20/11	720+	6
	4 Pumps, ESP De-tune Condition 4	06/21/11	720+	7
	8 Pumps, Low-load Condition #1	06/21/11**	450-600	7
	8 Pumps, Low-load Condition #2	06/22/11**	300-450	6

* These are estimated times and do not include any delays that might occur due to process problems, test equipment problems, weather delays, etc. The time required for de-tuning and process stabilization may vary, but should require approximately one hour per condition. Approximately 5.5 hours of testing will be required per condition – assuming there are no delays.

** During the baseline test condition, three (3) two-hour test runs will be conducted. Data collected from these 3 test runs will be used for (1) CAM development, (2) PM CEMS correlation development and (3) Consent Decree PM compliance demonstration.

*** Exact low-load conditions will need to be finalized with the plant. This testing may need to be performed at night and/or early morning. Testing at night may result in a shift in the test schedule of up to 24 hour.

The compliance test will be used as the baseline test condition for Unit 2 CAM and PM CEMS correlation testing. The Compliance test will consist of three (3) two-hour test runs conducted on Thursday June 16, 2011. During each of the three compliance test runs, filterable and condensable PM testing will be conducted in accordance with United States Environmental Protection Agency (USEPA) Reference Methods 5B and 202, respectively. The remaining CAM/PM CEMS correlation tests will be conducted using USEPA reference Method 5B for filterable PM, these sampling runs will be 90 minute in length. Since the CAM and PM CEMS correlation testing require that three (3) distinctly different PM loadings be used to develop the correlations, the actual number of tests will depend on preliminary test results obtained in the field.

The CEC sampling crew will set-up the testing equipment, at the Unit 2 sampling location, on Wednesday June 15, 2011 with a goal of starting the baseline testing on Thursday, June 16th at 0800.

Additional details regarding the proposed testing are presented in the completed Proposed Test Plan forms in Section 2.1.

2.1 PROPOSED TEST PLAN

Date Submitted: May 15, 2011

Attention: Mr. Kevin McCarthy

Proposed Test Date: June 16-June 28, 20101

1) FACILITY INFORMATION:		
Name: Westar Energy Inc.		
Address: 25905 Jeffrey Road		
City: St. Marys	State: KS	Zip: 66536
Name & Title of Contact Person: Mr. Kevin McCarthy		
Phone # of Contact Person: 785-806-0495		Fax # 785-575-8039

2) AIR POLLUTION SOURCE TO BE TESTED:				
Type of Facility/Source: Coal-fired Power Plant, Unit 2				
Permit #	FIPS/PLANT ID#:			PORT#:
Address/Location:				
Directions to Source (or map attached): see attached map				
Initial start-up Date:				
Reason for Text	X	Condition of Permit	X	Consent Agreement
		Administrative Order		
		Other (specify)		

3) TESTING FIRM INFORMATION		
Name: Civil & Environmental Consulting, Inc		
Address: 4848 Park 370 Blvd, Suite F		
City: Hazelwood	State: Missouri	Zip: 63042
Name & Title of Contact Person: Mr. Frank Stevens Senior Project Manager		
Phone # of Contact Person: 314-656-4566		Fax # 314-656-4595
Number of Employees of Firm:		435
Number of employees actually engaged in air pollution source testing:		12
Organizational chart with names & titles personnel: (please attach)		

3) TESTING FIRM INFORMATION: (cont)	
Location & description of laboratory facilities:	
CEC Office	
Subcontractor(s) utilized by firm for source testing activities: none anticipated for this program	
Number of air pollution sources previously tested by firm:	>500
Sources tested by firm in past 3 years	
Power Plants, Manufacturing Processes, Painting Processes, Printing Processes, Incinerators,	
Combustion Turbines	

4) PERFORMANCE TEST INFORMATION:					
Pollutant		No of Sampling Points	Total Time per Test Run	No. of Test Runs	Test Method to be used
1	Particulate	12	120 min.	3/Unit 2	Methods 1- 5B/202
2	Particulate	12	90	18/Unit 2	Methods 1- 5B
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

2.2 TEST FIRM INFORMATION

NAME OF FIRM:

Civil & Environmental Consultants, Inc.

ADDRESS OF OFFICE WHICH WILL PERFORM SAMPLING:

4848 Park 370 Blvd., Suite F, Hazelwood, Missouri 63042

NAME AND TITLE OF CONTACTS:

Mr. Chris Dawdy	Mr. Frank Stevens
Air Quality	Air Quality
Vice President	Senior Project Manager

TELEPHONE NUMBER OF CONTACTS:

(314) 656-4566

FAX TELEPHONE NUMBER OF CONTACTS:

(314) 656-4595

NUMBER OF PERSONNEL AT FIRM:

435

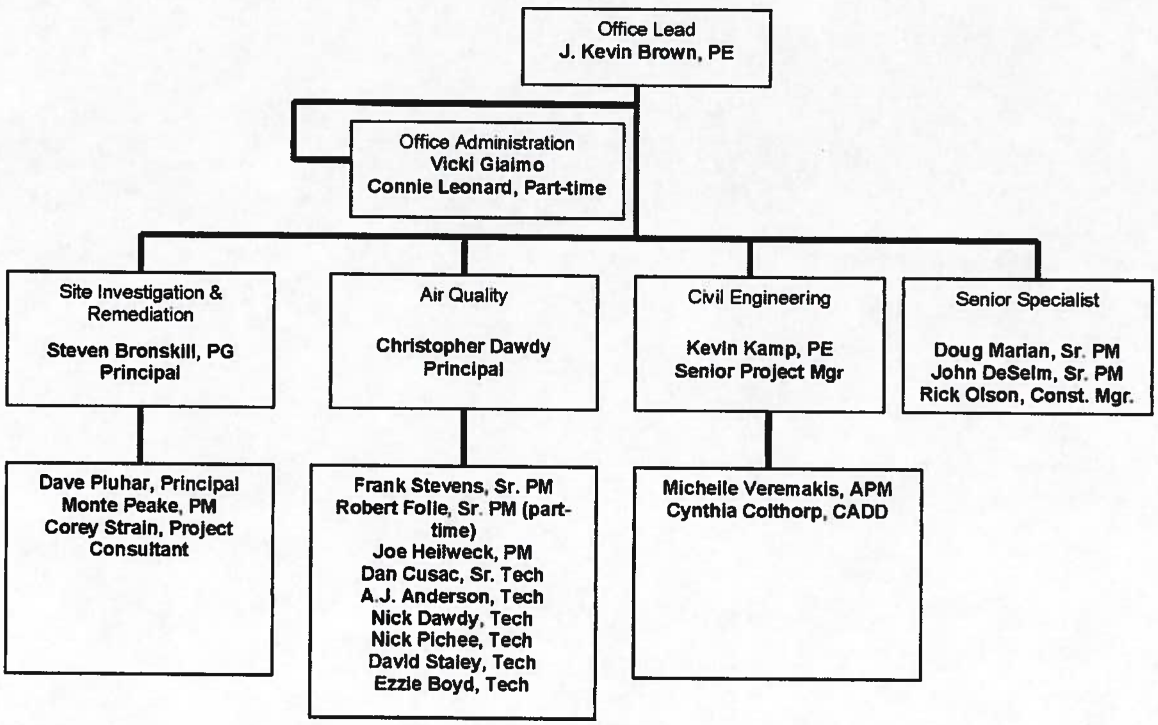
NUMBER OF PERSONNEL PROPOSED FOR THIS PROJECT:

6 Field Technicians

NAMES OF PERSONNEL PROPOSED FOR THIS PROJECT:

Frank Stevens
Dan Cusac
Andrew Anderson
Nick Pichee
Ezzie Boyd

St. Louis Office
Civil & Environmental Consultants, Inc.
Organizational Chart



Staff Assignments

1. Marketing – D. Marian
2. H & S – M. Peake
3. Workflow – K. Kamp
4. Vehicles – D. Cusac
5. Reg. Sales- G. Archeski

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 USEPA REFERENCE METHOD 5B/202 – FILTERABLE/ CONDENSABLE PARTICULATE

3.1.1 Testing Equipment

USEPA Method 5B Source Sampling Train: An Environmental System's C-5000 Source Sampling System will be used at the sampling location(s). The particulate sampling train consists of a ten foot effective length probe for Unit 2 with a calibrated Type K (chromel/alumel) thermocouple; a stainless steel liner; a standard glass impinger assembly with a calibrated Type K (chromel/alumel) thermocouple located at the impinger outlet; a 3/4-hp, shaft-sealed, carbon vane vacuum pump assembly with a vacuum gauge; a control unit with an elapsed time indicator, a temperature selector switch, a temperature indicator (potentiometer), temperature controllers, inclined manometers for determining ΔP and ΔH, a calibrated dry gas meter, and a calibrated variable-diameter orifice; umbilical and various interconnecting hoses, fittings, and valves. An appropriately sized stainless steel nozzle, a calibrated Type K (chromel/alumel) temperature sensor, a static pressure tube, and a calibrated S-type pitot tube are integral parts of the probe assembly.

The vacuum pump will be used to control gas sampling rates. The control unit will be also used to monitor elapsed sampling times, temperatures, velocities, static pressure, gas sampling rates, and sampled gas volumes.

Integrated Gas Sampling Train. Flue gas will be collected at the sampling location(s) for analysis with an integrated gas sampling train. The sampling train consists of a sample pump, flow meter, a Tedlar® bag; tygon tubing and various interconnecting fittings and valves.

Condensable Particulate Matter USEPA Method 202 (OTM 28) will be utilized to measure condensable particulate matter (CPM) and moisture content will be measured, per Method 4. This method includes procedures for measuring both organic and inorganic CPM. CPM is measured in the flue gas after passing through a filter. The USEPA Method 202 sampling train will be the back half of the USEPA Method 5B sampling train. The 202 sampling train consists of:

- Method 23 type condenser and a condensate dropout impinger without a bubbler tube;
- The dropout impinger is followed by a modified Greenburg Smith impinger with no taper;
- A filter holder with a Teflon® filter meeting the requirements in Section 6.1.2 of the method will be placed immediately following the modified Greenburg-Smith impinger. The connection between the CPM filter and the moisture trap impinger includes a thermocouple fitting that provides a leak-free seal between the thermocouple and the stack gas;
- A Greenburg Smith impinger containing 100 ml of water followed by an impinger containing silica gel to collect moisture that passes through the CPM filter.

A pretest leak-check will be performed and a leak rate of not more than 0.02 actual cubic feet per minute (acfm) will be considered acceptable per the method. The leak-check will be performed at a vacuum equal to or greater than the vacuum anticipated during the test run. The first two impingers of the sampling train are maintained separately from the back two impingers. The first two impingers will be kept in a dry compartment at a temperature less than 85° F. The second 2 impingers (after the CPM filter) are maintained at a temperature of less than 68° F. Figure 1 present a diagram of the Method 202 sampling train.

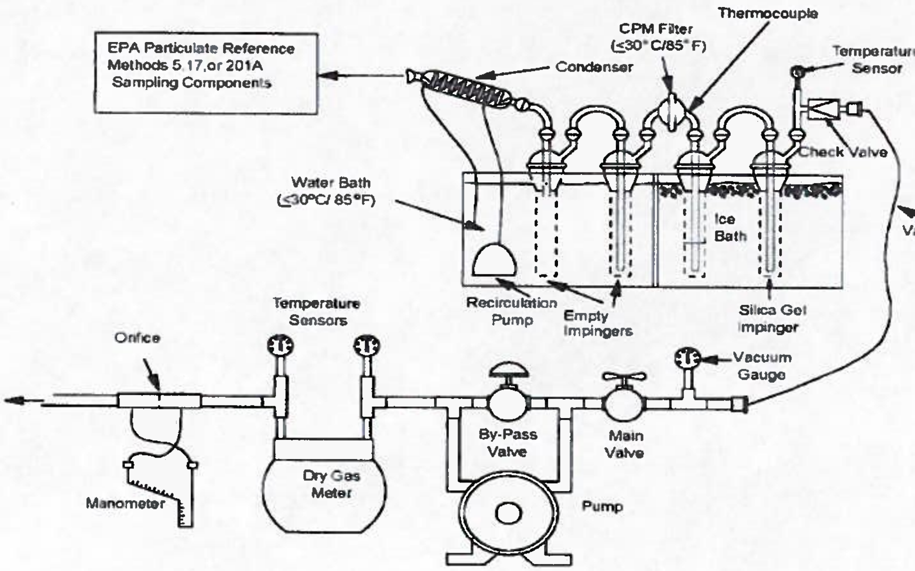


Figure 1: USEPA Method 202 Sampling Train

3.1.2 Sampling Procedures

Prior to field testing, the following procedures will be performed for the testing equipment. All instruments will be checked and calibrated prior to coming to site. To determine the initial tare weight of the filters, Pall Corporation Type A/E glass filters, 82.5 mm in diameter, with a 99.9 percent retention of 0.25 micron particles will be individually numbered, placed separately in petri dishes, oven-dried for two to three hours at 160 ± 5 °C (320 ± 10 °F), cooled in a desiccator for two hours, and individually weighed on an analytical balance to the nearest 0.1 milligram, then weighed every six hours, until two consecutive weights within ±0.5 milligram are obtained. Several 100 milliliter beakers will be oven dried at 160 ± 5 °C (320 ± 10 °F) and desiccated for a minimum of 24 hours and weighed in the same manner as the filters to obtain a tare weight. Several 250-gram quantities of Type 6-16 mesh indicating silica gel will be weighed on a top-loader electric balance and individually placed into separate airtight polypropylene storage bottles.

The number of sampling points and positions of the points in the flue at the sampling locations(s), and the sampling time at each point will be determined onsite prior to the particulate testing. Preliminary temperature and velocity traverse, monitor analysis of a bag sample, and calculations will be performed to determine a correct nozzle and orifice size

The sampling train will be prepared in part at the sampling location(s), before each test run, in the following manner. An appropriately sized sampling nozzle will be installed onto the inlet of probe and capped. The probe will be then dimensioned and marked with glass-cloth tape at increments that corresponded with the predetermined sampling point positions in the flue. For test runs that will also be used to determine PM compliance, a USEPA Method 202 impinger assembly will be prepared by adding 100 milliliters of distilled water to third impinger. The fourth impinger will be filled with 250 grams of Type 6-16 mesh indicating silica gel. The third and fourth impingers will be then placed into an ice bath. The first two impingers are dry and will be kept in room temperature water and water will be circulated through the condenser assembly. The filter holder will be attached to the sampling probe outlet. Next, the umbilical and sampling hoses will be connected to the sampling probe, impinger unit, vacuum pump, and control unit, accordingly. All incline manometers will be checked and zeroed. The entire sampling train assembly will be leak-checked at 15 inches of water vacuum for one minute and the leakage rate recorded. A leakage rate less than 0.02 cfm will be considered acceptable. After the particulate sampling train is assembled, and the entire system leak-checked, the particulate sampling will be performed. The sampling procedures will be performed in accordance with the Environmental Protection Agency's Reference Method 5B, "Determination of Non-sulfuric Acid Particulate Matter Emissions from Stationary Sources " as published in the "Standards of Performance for New Stationary Sources," and subsequent revisions in the Title 40, *Code of Federal Regulations,* Part 60, Appendix A.

Three test runs will be performed at the sampling location for Unit 2. A total of 12 points (three points from each of the four sampling ports in the stack) will be sampled. Except for the compliance test (baseline condition) which is two hours, each point will be sampled for a period of seven and a half minutes at a calculated isokinetic sampling rate. The total sampling time will be ninety minutes. The sampling data for each test run will be recorded on a field test form during each sampling period.

After the completion of a test run, the following recovery procedures will be performed. A final leak-check will be performed at the highest vacuum experienced during the sampling run, for one minute and the leakage rate recorded. A leak rate of not more than 0.02 actual cubic feet per minute (acfm) or 4% of the average sample flow during the test run, whichever is less, will be considered acceptable per the method.

The sampling nozzle and probe will be capped and taken to a clean area for sample recovery. At the recovery area, the filter will be carefully removed from the filter holder and transferred to its petri dish for baking, desiccation and weighing. The sampling nozzle, probe liner and filter holder inlet will be rinsed with high purity acetone. The acetone washing and an acetone blank will be collected in appropriately labeled amber glass sample bottles and retained for later evaporation, desiccation, and weighing. Flue gas concentrations (percent CO_2 and O_2) will be determined by taking the integrated gas sampling train and performing an instrumental analysis of the gas that was collected, simultaneously, with the particulate sampling. The integrated gas sample will be collected from the discharge of the particulate control unit. The CO_2 and O_2 concentrations for each test run will be recorded on a field test form.

For the compliance tests, the back-half of the Method 5B sampling train (Method 202) will be purged with nitrogen. The short stem impinger stem will be replaced with a modified Greenberg Smith impinger insert. The impinger tip length will extend below the water level in the impinger catch. If insufficient water is collected, a measured amount of degassed deionized, distilled ultra-filtered ASTM D1193-06, Type 1 or equivalent water will be added until the impinger tip is at least 1 cm below the surface of the water. The amount of water added to the dropout impinger will be recorded to correct the moisture content of the effluent gas. (**Note**: Prior to use, water must be degassed using a nitrogen purge bubbled through the water for at least 15 minutes to remove dissolved oxygen).

The purge line will be attached to a purged inline filter with no flow of gas through the clean purge line and fittings. The filter outlet will be connected to the inlet of the impinger train. The nitrogen gas flow will be started slowly while simultaneously opening the meter box pump valve(s). The pump bypass will be adjusted and the nitrogen delivery rate changed to obtain the following conditions: (1) 20 liters/min or ΔH@, and (2) a positive overflow rate through the rotameter of less than 2 liters/min. The condenser operation and recirculating water will be continued during the purge to maintain a temperature less than 85° F at the exit of the CPM filter. Ice will be left in the box for the last two impingers to prevent removal of moisture during the purge. If necessary, more ice will be added during the purge to maintain the gas temperature measured at the exit of the silica gel impinger below 20°C (68°F) until the sample recovery begins.

The purge will be continued for a period of one hour checking the rotameter and ΔH@ periodically to ensure the purge rate has not changed. After 1 hour the pump and the purge gas will be stopped simultaneously. After the purge is complete, recovery of the sample train begins:

- CPM Container #1, Aqueous Liquid Impinger Contents. Quantitatively transfer liquid from the dropout and the impinger prior to the CPM filter into a clean sample bottle (glass or plastic);
- Rinse the condenser, each impinger and the connecting glassware, and the front half of the CPM filter housing twice with water. Recover the rinse water, and add it to the same sample bottle. Mark the liquid level on the bottle. CPM Container #1 holds the water soluble CPM captured in the impingers;
- CPM Container #2, Organic Rinses. Follow the water rinses of the probe extension, condenser, each impinger and all of the connecting glassware and front half of the CPM filter with an acetone rinse. Then repeat the entire procedure with two rinses of hexane. And save both solvents in the same container identified as CPM Container #2. Mark the liquid level on the jars;

- CPM Container #3, CPM Filter Sample. Use tweezers and/or clean disposable surgical gloves to remove the filter from the CPM filter holder. Place the filter in the petri dish identified as CPM Container #3;
- The cold impinger water and the silica gel impinger will be weighed in the field and discarded.

The flue gas moisture collected in the first three impingers will be measured and recorded. The moisture laden silica gel in the fourth impinger will be weighed. The weight gain of the silica gel will be added to the measured moisture condensed during the test run to determine the total moisture collected for that run.

3.1.3 Analytical Procedures

After the field testing is completed, the following procedures will be performed for the filterable particulate. The silica gel, filters, filter blank, acetone washings, and acetone blank(s) from the test runs will be analyzed by Civil & Environmental Consultants, Inc., Hazelwood, Missouri. The analytical procedures will be performed in accordance with the Environmental Protection Agency's Reference Method 5B.

Each filter and beaker will be oven dried at 320 °F for six hours. The filters will be transferred into the desiccator for two to three hours to obtain a weight and then weighed every six hours, minimum, until two consecutive weights are obtained that agree within ±0.1 milligram.

The acetone rinse and an acetone blank will be evaporated in tared beakers on a hot plate to determine the level of particulate collected in the nozzle, probe liner and the front half of the filter holder and to determine the amount of residual weight each beaker retained due to acetone impurities. After evaporating to dryness the tared beakers will be placed in a desiccator to cool. Each filter, acetone washing and acetone blank will be individually weighed on an analytical balance with a sensitivity of 0.1 milligram.

The CPM samples will be sent to Enthalpy Analytical in Durham, North Carolina for analysis. The samples will be shipped to the laboratory following the completion of the compliance/baseline testing.

4.0 REPORT FORMAT

The final report for the compliance source emissions testing will consist of the following format:

1.0 INTRODUCTION

Summary of test program

Key Personnel

2.0 SUMMARY OF TEST RESULT

Detailed description of testing program field test changes and/or problems (if Applicable) summary of all test results (tables, charts, etc...)

3.0 DESCRIPTION OF TESTED FACILITY

Process description

Control equipment description

Sampling locations

4.0 SAMPLING AND ANALYTICAL PROCEDURES

Test methods used

5.0 QUALITY ASSURANCE

APPENDICES

APPENDIX A – Field Data Sheets

APPENDIX B - Electronic Data Sheets and Example Calculations

APPENDIX C - Plant Data

APPENDIX D - Calibration for Test Equipment

APPENDIX E - Laboratory Reports

APPENDIX A

EPA FORMULAS

Nomenclature

A_n=Cross-sectional area of nozzle, m^2 (ft^2).

B_{ws}=Water vapor in the gas stream, proportion by volume.

C_a=Acetone blank residue concentration, mg/mg.

C_s=Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (gr/dscf).

I=Percent of isokinetic sampling.

L_1=Individual leakage rate observed during the leak-check conducted prior to the first component change, m^3 /min (ft^3 /min)

L_a=Maximum acceptable leakage rate for either a pretest leak-check or for a leak-check following a component change; equal to 0.00057 m^3 /min (0.020 cfm) or 4 percent of the average sampling rate, whichever is less.

L_i=Individual leakage rate observed during the leak-check conducted prior to the "i^{th}" component change (i=1, 2, 3 . . . n), m^3 /min (cfm).

L_p=Leakage rate observed during the post-test leak-check, m^3 /min (cfm).

m_a=Mass of residue of acetone after evaporation, mg.

m_n=Total amount of particulate matter collected, mg.

M_w=Molecular weight of water, 18.0 g/g-mole (18.0 lb/lb-mole).

P_{bar}=Barometric pressure at the sampling site, mm Hg (in. Hg).

P_s=Absolute stack gas pressure, mm Hg (in. Hg).

P_{std}=Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

R=Ideal gas constant, 0.06236 ((mm Hg)(m^3))/((K)(g-mole)) {21.85 ((in. Hg) (ft^3))/((°R) (lb-mole))}.

T_m=Absolute average DGM temperature K (°R).

T_s=Absolute average stack gas temperature K (°R).

T_{std}=Standard absolute temperature, 293 K (528 °R).
V_a=Volume of acetone blank, ml.

V_{aw}=Volume of acetone used in wash, ml.

V_{1c}=Total volume of liquid collected in impingers and silica gel ml.

V_m=Volume of gas sample as measured by dry gas meter, dcm (dcf).

Vm(std)=Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

Vw(std)=Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).

V_s=Stack gas velocity, calculated by Method 2, Equation 2–7, using data obtained from Method 5, m/sec (ft/sec).

W_a=Weight of residue in acetone wash, mg.

Y=Dry gas meter calibration factor.

ΔH=Average pressure differential across the orifice meter (see Figure 5–4), mm H_2O (in. H_2O).

ρ_a=Density of acetone, mg/ml (see label on bottle).

ρ_w=Density of water, 0.9982 g/ml. (0.002201 lb/ml).

Θ=Total sampling time, min.

Θ_1=Sampling time interval, from the beginning of a run until the first component change, min.

Θ_i=Sampling time interval, between two successive component changes, beginning with the interval between the first and second changes, min.

Θ_p=Sampling time interval, from the final (n^{th}) component change until the end of the sampling run, min.

13.6 =Specific gravity of mercury.

60=Sec/min.

100=Conversion to percent.

Dry Gas Volume standard conditions (20 °C, 760 mm Hg or 68 °F, 29.92 in. Hg) by using Equation 5–1.

$$V_{m(std)} = V_m Y \frac{T_{std}\left(P_{bar} + \frac{\Delta H}{13.6}\right)}{T_m P_{std}} \qquad Eq.\ 5\text{-}1$$

$$= K_1 V_m Y \frac{P_{bar} + \left(\frac{\Delta H}{13.6}\right)}{T_m}$$

Volume of Water Vapor Condensed.

$$V_{w(std)} = V_{1c} \frac{\rho_w R T_{std}}{M_w P_{std}} \qquad \text{Eq. 5-2}$$

$$= K_2 V_{1c}$$

Where:

K_2=0.001333 m^3 /ml for metric units,=0.04706 ft^3 /ml for English units.

Moisture Content.

$$B_{ws} = \frac{V_{w(std)}}{V_{m(std)} + V_{w(std)}} \qquad \text{Eq. 5-3}$$

Note: In saturated or water droplet-laden gas streams, two calculations of the moisture content of the stack gas shall be made, one from the impinger analysis (Equation 5–3), and a second from the assumption of saturated conditions. The lower of the two values of B_{ws} shall be considered correct. The procedure for determining the moisture content based upon the assumption of saturated conditions is given in Section 4.0 of Method 4. For the purposes of this method, the average stack gas temperature from Figure 5–3 may be used to make this determination, provided that the accuracy of the in-stack temperature sensor is ±1 °C (2 °F).

Acetone Blank Concentration.

$$C_a = \frac{m_a}{V_a \rho_a} \qquad \text{Eq. 5-4}$$

Acetone Wash Blank.

$$W_a = C_a V_{aw} \rho_a \qquad \text{Eq. 5-5}$$

Total Particulate Weight. Determine the total particulate matter catch from the sum of the weights obtained from Containers 1 and 2 less the acetone blank

Note: In no case shall a blank value of greater than 0.001 percent of the weight of acetone used be subtracted from the sample weight. Refer to Section 8.5.8 to assist in calculation of results involving two or more filter assemblies or two or more sampling trains.

Particulate Concentration.

$$C_s = \frac{K_3 m_n}{V_{m(std)}} \qquad \text{Eq. 5-6}$$

Where:

K_3=0.001 g/mg for metric units.

=0.0154 gr/mg for English units.

12.10 Conversion Factors:

From	To	Multiply by
ft^3	m^3	0.02832
gr	mg	64.80004
gr/ft^3	mg/m^3	2288.4
mg	g	0.001
gr	lb	1.429×10^{-4}

Isokinetic Variation.

Calculation from Raw Data.

$$I = \frac{100 T_s \left[K_4 V_{1c} + \frac{(V_m Y)}{T_m} \left(P_{bar} + \frac{\Delta H}{13.6} \right) \right]}{60 \theta v_s P_s A_n} \qquad \text{Eq. 5-7}$$

Where:

K_4=0.003454 ((mm Hg)(m^3))/((ml)(°K)) for metric units,

=0.002669 ((in. Hg)(ft^3))/((ml)(°R)) for English units.

Calculation from Intermediate Values.

$$I = \frac{T_s V_{m(std)} P_{std} 100}{T_{std} v_s \theta A_n P_s 60 (1 - B_{ws})} \qquad \text{Eq. 5-8}$$

$$= K_5 \frac{T_s V_{m(std)}}{P_s v_s A_n \theta (1 - B_{ws})}$$

Where:

K_5=4.320 for metric units,

=0.09450 for English units.

Acceptable Results. If 90 percent ≤ I ≤ 110 percent.

Molecular Weight of Stack Gas.

$$\mathrm{M}_s = M_d (1 - B_{ws}) + 18.0\, \mathrm{B}_{ws} \qquad \text{Eq. 2-6}$$

Average Stack Gas Velocity.

$$\mathrm{V}_s = K_p C_p \sqrt{\Delta p_{avg}} \sqrt{\frac{T_{s(abs)}}{P_s M_s}} \qquad \text{Eq. 2-7}$$

$$34.97\frac{\text{m}}{\text{sec}}\left[\frac{(g/g\cdot mole)(mmHg)}{(^\circ K)(mmH_2O)}\right]^{\frac{1}{2}}$$ Metric

$$85.49\frac{\text{m}}{\text{sec}}\left[\frac{(lb/lb\text{-}mole)(in.Hg)}{(^\circ R)(in.\ H_2O)}\right]^{\frac{1}{2}}$$ *English*

Average Stack Gas Dry Volumetric Flow Rate.

$$Q=3600(1-B_{ws})v_sA\left[\frac{T_{std}P_s}{T_{s(abs)}P_{std}}\right]$$ *Eq.* 2-8

Calculate K′ using Equation 5–11.

$$K' = \frac{K_1V_mY\left(P_{bar}+\frac{\Delta H}{13.6}\right)T_{amb}^{\ 1/2}}{P_{bar}T_m\theta}$$ Eq. 5-11

Where:

K′=Critical orifice coefficient,

[m^3)(°K)1/2]/

[(mm Hg)(min)] {[(ft^3)(°R)1/2)] [(in. Hg)(min)].

T_{amb}=Absolute ambient temperature, °K (°R).

APPENDIX B

TEST DATA SHEETS

Page ____ of ____

PLANT ______________________

CITY, STATE ______________________

STACK ______________________

PROJECT ______________________

DATE ______________________

Run No. ______________________

VELOCITY/CYCLONIC FLOW TRAVERSE DATA

	PORT AND POINT	YAW ANGLE DEGREE	STACK TEMP. °F	ΔP in. H_2O	$(\Delta P)^{1/2}$
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
AVERAGE					

PITOT TUBE

Number ______________

Coeficient (C_p) ______________

Calibration Date ______________

PRESSURES

Barometeric, P_{bar} ______________ in. Hg

Static, P_{static} ______________ in. H_2O

Stack $(P_s) = (P_{static}/13.6) + P_{bar}$

P_s = ______________ in. Hg

CALCULATIONS

Stack Diameter, D ______________ in.

Stack Area $(A) = ((D/12)/2)^2 * Pi$

A = ______________ ft^2

Nitrogen Conc. ______________ %

Carbon Dioxide Conc. ______________ %

Oxygen Conc. ______________ %

Molecular Weight, Dry = ______________ lb/lb-mole

Molecular Weight, Wet = ______________ lb/lb-mole

Stack Temp. (T_s) = ______________ °R

Moisture Content, Assumption ______________ %

Stack Gas Velocity (V_s)

$V_s = \{(T_s)/(P_s * MS)\}^{1/2} * C_p * (\Delta P)^{1/2} * 84.49$

V_s = ______________ ft/sec

Actual Volumetric Flowrate (Q_a)

$Q_a = 60 * V_s * A$

Q_a = ______________ acfm

Dry Standard Volumetric Flowrate (Q_{STD})

$Q_{STD} = 17.64 * Q_a * DGF * P_s / T_s$

Q_{STD} = ______________ dscfm

Signature ______________________

	Filter / Beaker #	Date / Time Weight, gm / By		Date / Time Weight, gm / By		Date / Time Weight, gm / By		Net Tare Weight	
1								0.0000	1
2		1/0/1900		1/0/1900		1/0/1900		0.0000	2
3		1/0/1900		1/0/1900		1/0/1900		0.0000	3
4		1/0/1900		1/0/1900		1/0/1900		0.0000	4
5		1/0/1900		1/0/1900		1/0/1900		0.0000	5
6		1/0/1900		1/0/1900		1/0/1900		0.0000	6
7		1/0/1900		1/0/1900		1/0/1900		0.0000	7
8		1/0/1900		1/0/1900		1/0/1900		0.0000	8
9		1/0/1900		1/0/1900		1/0/1900		0.0000	9
10		1/0/1900		1/0/1900		1/0/1900		0.0000	10
11		1/0/1900		1/0/1900		1/0/1900		0.0000	11
12		1/0/1900		1/0/1900		1/0/1900		0.0000	12
13		1/0/1900		1/0/1900		1/0/1900		0.0000	13
14		1/0/1900		1/0/1900		1/0/1900		0.0000	14
15		1/0/1900		1/0/1900		1/0/1900		0.0000	15
16		1/0/1900		1/0/1900		1/0/1900		0.0000	16
17		1/0/1900		1/0/1900		1/0/1900		0.0000	17
18		1/0/1900		1/0/1900		1/0/1900		0.0000	18
19		1/0/1900		1/0/1900		1/0/1900		0.0000	19
20		1/0/1900		1/0/1900		1/0/1900		0.0000	20

Date:	Operator: Run No.:	Hot Box No.:	Barometric Pressure:
Client:	Run Start Time:	Cold Box No.:	Stack Diameter, In.:
Plant Location:	Run Stop Time:	Console No.:	Nozzel Diameter, In.:
Source I. D.:	Pretest Leak Check @ "Hg for CFM	Pitot No.:	Filter No.:
Project Name:	Posttest Leak Check @ "Hg for CFM	Pitot Coefficient:	Ambient Temp.:
Project No.:	Pretest Leak Check Pitot Tube @ "H_2O	DGMC Factor:	Static Pressure:
	Posttest Leak Check Pitot Tube @ "H_2O	Meter Delta H @:	K-Factor:

Port & Traverse Point No.	Sample Time	Dry Gas Meter Reading	Velocity Head ("H_2O)		Orifice Pressure Differential ("H_2O)		Stack Gas Temp. (°F)	Sample Train Temperature (°F)					Vacuum ("Hg)
			Delta P	SQRT Delta P	Calc.	Actual		Probe	Filter Box	Last Impinger	Dry Gas Meter In	Dry Gas Meter Out	
Total:													
Average:													

Condensed Moisture	Final Weight	Initial Weight	Weight Gained
First Impinger			
Second Impinger			
Third Impinger			
Fourth Impinger			
Fifth Impinger			
Silica Gel			
Total Condensate			

Gas Analysis

Trial	O_2	CO_2	CO	N_2
1				
2				
3				
Average				

Comments:

APPENDIX C

TEST PERSONNEL RESUMES

FRANKLIN M. STEVENS

SENIOR PROJECT MANAGER

EDUCATION

BS Chemistry, University of North Carolina at Chapel Hill

REGISTRATIONS

Certified Project Manager, Villanova University

QSTI, Qualified Stack Testing Individual

OSHA 29 CFR 1910.120 initial 40-hour training and refresher course in Hazardous Materials/Waste Site

Mr. Stevens is a Senior Project Manager with over 20 years of experience performing and managing projects for source emissions testing, air quality regulatory compliance, and air toxics sampling and analysis. Mr. Stevens' diverse environmental testing experience includes Continuous Emissions Monitoring Systems (CEMS) certification programs involving Relative Accuracy Test Audits (RATA's), Cylinder Gas Audits (CGA's), Linearity checks and system repair and general maintenance. Mr. Stevens has performed and managed projects involving air toxics sampling for dioxins/furans, volatile and semi-volatile organics, Hazardous Air Pollutants (HAP's), control equipment efficiency testing, guarantee performance testing, gas turbine emissions testing, electrostatic precipitator optimization and gas flow studies. Mr. Stevens has also performed and managed compliance and engineering tests of point and fugitive emission sources. Mr. Stevens has managed and performed projects designed to fill data needs for the development of EPA regulations and methods including non-routine CEMs demonstrations for mercury and particulate matter.

PROJECTS

- **Kansas City Power & Light, Kansas City, MO.** Mr. Stevens was the Project Manager/Field Supervisor participating in Compliance Assurance Monitoring testing at a coal powered power plant to determine total particulate emissions. Several runs were conducted each day at different operating conditions. Testing methods included USEPA 5B and USEPA OTM 28. Preliminary analysis of the 5B samples was performed in the field. Mr. Stevens participated in preparation, mobilization, sampling, recovery, analysis, and demobilization phases of the project.

- **Westar, St Mary's, Kansas.** Mr. Stevens was the Project Manager/Field Supervisor participating in Compliance Assurance Monitoring testing at a coal powered power plant to determine total particulate emissions. Several runs were conducted each day at different operating conditions. Testing methods included USEPA 5B for 3 sources 6 runs per day. Preliminary analysis of the 5B samples was performed in the field. Mr. Stevens participated in preparation, mobilization, sampling, recovery, analysis, and demobilization phases of the project.

- **Kansas City Power & Light Iatan , MO.** Mr. Stevens was the project manager and Field Team leader for a project to take NOx measurements at 56 points for tuning and optimizing and SCR. After tuning the system ammonia slip measurements were taken at the outlet of the SCR on two ducts simultaneously using CTM -027.

- **Kansas City Board of Public Utilities, Kansas City, KS.** Mr. Stevens was the Project manager participating in a RATA of a coal fired power plant. Testing methods to perform the RATA included USEPA 6C for SO_2, USEPA 7E for NO_x, USEPA 3A for O_2/CO_2, USEPA 1 for sampling point determination, USEPA 2 for stack flow velocity, and USEPA 4 for moisture determination. Mr. Stevens participated in the test plan development.

Senior Leadership

Integrated Services

Personal Business Relationships

preparation, mobilization, sampling, recovery, and demobilization phases of the project. Testing was also performed on an incinerator for particulate matter using USEPA method 5.

- **Kansas City Power & Light, Kansas City, MO.** Mr. Stevens was the Project Manager participating in testing to determine ammonia slip on a reactor unit at a coal fired power plant using USEPA method CTM 027. Mr. Cusac participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project.

- **USEPA Method 301 Validation of USEPA Method 29 for the Speciation of Mercury from Cement Kilns, burning hazardous waste, Holcim Holly Hill SC:** Managed a test program for the USEPA Office of Solid Waste looking at the potential for utilizing USEPA Method 29 for the speciation of mercury in the flue gas of a long wet kiln burning hazardous waste. A quad sampling train set-up was designed and built to be able to dynamically spike two of the sampling trains with mercury and mercuric chloride while sampling for mercury. Nine runs were performed and the results were evaluated per USEPA Method 301.

- **USEPA Method 23 Measurements at a Cement Kiln (Ash Grove Cement) for defining the impact of various operating conditions on Dioxin/Furan Formation during waste combustion:** Performed USEPA Method 23 at the inlet and outlet of a cement kiln to determine the impact various operation conditions on the formation of Dioxin and Furan emissions from the kiln.

- **Data Collection for USEPAs Office of Solid Waste at waste Incinerators**: performed a variety of sampling projects collected emissions data and air pollution control equipment efficiency data for the development of a MACT floor for the revision of the hazardous waste combustion regulations.

- **Mercury CEMS testing Nalco Mobotec – Richmond, IN.** Provided technical support in conducting emissions testing using mercury CEMS and sorbent trap tubes method 30B on the ESP inlet, outlet, and stack at a coal-fired power plant. Four 30B test runs were conducted each day for a six week period with the addition of CEMS monitoring during the last week of the project.

- **Mercury Characterization at a Utility Boiler:** Managed and performed mercury measurements at a utility boiler under different load conditions prior to and after the pollution control equipment. ASTM Method 6784-02 (Ontario Hydro) was utilized to determine the mercury concentrations in the utility boiler flue gas stream prior to and after the air pollution control systems. The project was designed to determine the impact of the air pollution control equipment on the overall mercury emissions.

- **Evaluation of Bio-scrubber System for Controlling VOC Emissions: Managed** and performed testing for four organic HAP's (methanol, phenol, formaldehyde, and pinene) utilizing EPA Reference Method 320 – Fourier Transform Infrared Spectroscopy (FTIR) simultaneously at the Bio-scrubber system inlet and outlet (exhaust) in parallel with the National Council for Air

Stream Improvement (NCASI) Reference Method 99.02. The data was collected continuously during an eight to ten hour period while the plant varied the operation of the bio-scrubber system. In addition to pollutant-specific methods, US EPA Reference Methods 25A was used for determining the total VOC emissions at the Bio-scrubber system outlet. A test protocol was written and supplied to the state for the testing activities. In addition to evaluating the Bi0-scrubber system a comparison was made between the data generated by FTIR for the four HAP's of concern and the data from the NCASI method 99.02.

- **Oriented Strand Board facility testing for Compliance with The National Emission Standards for Hazardous Air Pollutants for Plywood and Composite Wood Products Manufacture (PWCP):** Managed and performed an engineering test to determine the facility's position relative to the requirements in the PWCP MACT. Four locations were sampled simultaneously along with six process vents. Two locations were sampled simultaneously for formaldehyde, benzene, phenol, acetaldehyde and methanol using EPA Method 320 an instrumental method utilizing Fourier Transform Infrared (FTIR) spectroscopy, a technique for identifying organic and inorganic materials. EPA Method 5 and EPA method 26A were performed at two locations and EPA Method 25A for Total Volatile Organic Emissions was run at four locations. EPA Methods 3A and 7E were performed at the outlet of the regenerative thermal oxidizer. In addition NCASI Method 99.01 was performed at six process vents of organic emissions. Testing was performed for two different raw materials to determine the impact on emission by changing manufacturers of materials used in the process. A test protocol was written and accepted by the state prior to any onsite testing activities.

- **Boiler MACT Testing on Seven Boilers:** Managed and performed emission testing on seven boilers used to produce steam and power for a chemical manufacturing facility. United States Environmental Protection Agency (US EPA) Methods 1 through 5 was used for the determination of particulate matter, Method 26A was used for the determination of hydrogen chloride and chlorine concentrations and emission rates. Method 29 was used for the determination of arsenic, beryllium, cadmium, chromium, lead, manganese, mercury, nickel, and selenium concentrations and emission rates. A test plan was written and submitted to the state for approval prior to conducting test activities.

- **Selective Catalytic Rreduction (SCR) unit Testing at a Cogeneration Facility:** Managed and performed testing of a Zero-Slip™ SCR system at a full scale Cogeneration facility operated by Paramount Petroleum in Southern California. The system was a cogeneration facility with a nominal rating of 7 MW and was built to provide power and steam for the site. Primary performance verification measurements on the system included NOx and ammonia determinations at various locations in the system. NOx measurements were made at the SCR catalyst layer inlet, the SCR catalyst layer outlet and the Zero-Slip™ catalyst layer outlet. Ammonia measurements were made at both the SCR catalyst layer outlet and the stack. NOx in the flue gas was measured using a continuous emissions monitoring system (CEMS) under SCAQMD Method 100.1. Ammonia

Concentrations were determined isokinetically using EPA Method CTM 027. In addition, gas concentrations for NH_3 were monitored at the stack during normal plant operations with a FTIR CEMS system for a period of six months.

- **Relative Accuracy Test Audit (RATA):** Managed and performed a relative accuracy test audit for a 40 CFR Part 75 compliant CEM system on a utility boiler. Testing was performed simultaneously with the utility's emission measurement team. The project included assisting the Utility's test team with trouble shooting their mobile system resolving set-up and leak issues. The gas RATA was performed at High load and flow RATA was performed at High, Mid and Low loads.

- **Initial Certification of 40 CFR Part 75 Compliant Continuous Emission Monitoring Systems:** Managed and performed testing services to assist a major utility in the certification of their Phase I and Phase II emission monitoring systems for flow, nitrogen oxides, sulfur dioxide, and the diluents. The testing team utilized three mobile Continuous Emission Monitoring systems to certify the CEMs systems at eleven facilities. Preliminary reports were generated on site at the completion of testing. System diagnostic services were also supplied at each facility when the system failed to meet specifications. Testing included EPA methods 1-4, 6C, 7E, Performance Specification 2 and 40 CFR Part 75 Appendix A.

- **Tire Incinerator Testing:** Managed and performed emission testing at a rotary kiln burning whole tires to produce stream for adjoining manufacturing facilities. Testing was performed for multiple metals (EPA Method 29), aldehydes and ketones (SW-846 Method 0011), semivolatiles (SW-846 Method 0010), particulate matter and hydrogen chloride (EPA Method 5/26A). In addition to the manual methods EPA instrumental Methods 3A, 6C and 10 were used to continuously monitor oxygen and carbon dioxide, sulfur dioxide and carbon monoxide, respectively.

SELECTED PUBLICATIONS

Chun W. Lee, and Ravi K. Srivastava, U.S. Environmental Protection Agency, Office of Research and Development, National Risk Management Research Laboratory, Air Pollution Prevention and Control Division (MD-E305-01) S. Behrooz Ghorishi ARCADIS Geraghty & Miller, Inc., Thomas W. Hastings, and Frank M. Stevens Cormetech, Inc.; "SCR Impact on Mercury Speciation in Coal-fired Boilers"; Department of Energy, Office of Fossil Energy and National Energy Technology Laboratory, Poster Session, "2003 Conference on Selective Catalytic Reduction and Non-Catalytic Reduction for NOX Control", October 29-30, 2003

Lee, C.W. and Srivastava, Riva, US Environmental protection Agency, National Risk Management Research Laboratory Air Pollution Prevention and Control Division, Ghorishi, Behrooz S., Arcadis Geraghty & Miller, Hastings, Thomas W., and Stevens, Frank Cormetech, Inc.; "Study of Speciation of Mercury under Simulated SCR NOx Emissions Control Conditions",; ICAC Forum '03 Multi Emission Controls & Strategies, Nashville, Tenn.

Hastings, Thomas, Murano, Jun and Stevens, Franklin, Cormetech, Inc. 500 International Drive, Durham NC 27512, Hattori, Akira Mitsubishi Power Systems, 100 Bayview Circle, Suite 4000, Newport Beach California 92660, Iida, Kozo Mitsubishi Heavy Industry 6-22, 4-Chome, Kan-on-shin-Machi, Nishi-Ku, Hiroshima 733-8553 Japan and Kiyosawa, Masashi, Mitsubishi Heavy Industry 1-1, Akunoura-Machi, Nagasaki, 850-8610 Japan; "Zero Slip Technology for Combined Cycle Gas Turbine Exhaust";; ICAC Forum '03 Multi Emission Controls & Strategies, Nashville, Tenn.

Hastings, Thomas, Murano, Jun and Stevens, Franklin, Cormetech, Inc. 5000 International Drive, Durham NC 27512, Hattori, Akira Mitsubishi Power Systems, 100 Bayview Circle, Suite 4000, Newport Beach California 92660, Iida, Kozo Mitsubishi Heavy Industry 6-22, 4-Chome, Kan-on-shin-Machi, Nishi-Ku, Hiroshima 733-8553 Japan and Kiyosawa, Masashi, Mitsubishi Heavy Industry 1-1, Akunoura-Machi, Nagasaki, 850-8610 Japan "Zero Slip Technology for Combined Cycle Gas Turbine Exhaust"; Power Gen International 2003, Environmental Issues with Combustion Turbines, Las Vegas, Nevada

Pritchard, Scot, Iskandar, Reda, Stevens, Franklin and von Alten, Robert: Cormetech, Inc., 5000 International Drive, Durham NC 27512;"SCR Catalysts Development for Low SO2 to SO3 Oxidation"; 2002 Electric Power Research Institute Workshop on Selective Catalytic Reduction

Haas, Ronald J., Ph.D., and Stevens, Franklin; Triangle Laboratories, Inc.; "Dealing with Dioxins Part II: The State of Analytical Methods"; Food Safety Magazine, Page 14-16; Volume 6, Number 6, December 2000/January 2001

Stevens, Franklin; Triangle Laboratories, Inc.; "Dealing with Dioxins Part II: The State of Analytical Methods"; Environmental Testing and Analysis, Page 17-19, 51; Volume 9, Number 6, November/December 2000

Burns, Dan Westinghouse Savannah River Technology Center, Rauenzahn, Scott, US EPA, Office of Solid Waste Management, Stevens, Franklin, Energy and Environmental Research Corporation "Joint EPA/DOE Demonstration Program for Total Mercury Continuous Emissions Monitors"; 1997 Air and Waste Management Association Annual meeting Toronto Canada

Stevens, Franklin, Energy and Environmental Research Corporation, Rauenzahn, Scott, US EPA, Office of Solid Waste Management, Burns, Dan Savannah Technical Center and Westlin, Peter Research Triangle Institute; "Method 301 Validation of Proposed Draft Method 101 B for the Speciation of Mercury"; 1997 Air and Waste Management Association Annual Meeting Toronto Canada

Stevens, Franklin M., Lanier, Steven W., and Folk, Edgar, Energy and Environmental Research Corporation, Garg, Shiva US EPA office of Solid Waste Management; "Innovative Field Sampling Approach to the Identification and Quantitation of Organic Emissions from Point Sources"; 1997 Proceedings International Conference on Incineration and Thermal Treatment Technologies Oakland, California

Lanier, Steven W., Stevens, Franklin M. Energy and Environmental Research Corporation "Dioxin Compliance Strategies for HWC MACT Standards";

Proceedings from 1996 International Conference on Incineration and Thermal Treatment Technologies, May 1996.

Draft Particulate Matter CEMs Demonstration, Vol. I: Dupont Inc. Experimental Station On-Site Incinerator, Wilmington, DE (October 1997)

PROFESSIONAL AFFILIATIONS

Source Evaluation Society
National Member Air and Waste Management Association

DANIEL M. CUSAC

SENIOR TECHNICIAN

Mr. Cusac has over sixteen years of experience in source emissions testing, fugitive emissions monitoring, and ambient air monitoring.

SELECTED PROJECT EXPERIENCE

- **Kansas City Power & Light, Kansas City, MO.** Mr. Cusac was the Team Leader participating in USEPA ICR testing at four different test sites over a two month period. Testing methods included USEPA 10A, USEPA 316, USEPA 25A, USEPA 18, USEPA 0031, USEPA 0010, USEPA 26A, USEPA CTM 033, USEPA 7E, USEPA 6C, USEPA 30B, USEPA 29, USEPA OTM 27, USEPA OTM 28, USEPA 3A, USEPA 1, USEPA 2, and USEPA 4. Mr. Cusac participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project.

- **Westar, St. Mary's, KS.** Mr. Cusac was the Team Leader participating in testing at a coal powered power plant to determine total particulate emissions. Several runs were conducted each day at different operating conditions. Testing methods included USEPA 5B and USEPA OTM 28. Mr. Cusac participated in preparation, mobilization, sampling, recovery, analysis, and demobilization phases of the project.

- **Kansas City Board of Public Utilities, Kansas City, KS.** Mr. Cusac was the Team Leader participating in a RATA of a coal fired power plant. Testing methods to perform the RATA included USEPA 6C for SO_2, USEPA 7E for NO_x, USEPA 3A for O_2/CO_2, USEPA 1 for sampling point determination, USEPA 2 for stack flow velocity, and USEPA 4 for moisture determination. Mr. Cusac participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Testing was also performed on an incinerator for particulate matter using USEPA method 5.

- **Kansas City Power & Light, Kansas City, MO.** Mr. Cusac was the Team Leader participating in testing to determine ammonia slip on a reactor unit at a coal fired power plant using USEPA method CTM 027. Mr. Cusac participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project.

- **30-Day NOx emissions testing, KCP&L, St. Joseph, MO.** Mr. Cusac was the Team Leader participating in the setup and tear down of this project. Mr. Cusac conducted daily bias and equipment checks for Lake Road utility boiler.

- **Emissions Monitoring Certifications, Holcim, Inc.** The facility operates a rotary kiln subject to the BIF regulations. He certified four CEM systems located at various points in the kiln and exhaust stack. The certifications included cylinder gas audits and relative accuracy audits for carbon monoxide, oxygen, and total hydrocarbons.

EDUCATION
Metals Technology, Illinois Central College, 1993

REGISTRATION
Professional Registration

TRAINING/ CERTIFICATIONS
OSHA 29 CFR 1910.120 initial 40-hour training and refresher course in Hazardous Materials/Waste Site Investigation

OSHA 29 CFR 1910.120 Supervisor Training Course in Hazardous Materials/Waste Site Operations

MSHA Part 46 24-Hour Training

Lead and Asbestos Awareness Training

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- **CEM Certifications, Buzzi Unicem.** Field team leader that conducted a relative accuracy test audit on O_2 CEMS at the Buzzi Unicem facility in Cape Girardeau, Missouri. The project included conducting nine, 21-minute test runs to determine the relative accuracy of the O_2 system.

- **CEM Certifications, Bunge.** As the field team leader, he conducted the relative accuracy test audit on a NO_x CEMS at the Bunge facility in Morristown, Indiana. The project included conducting nine, 21-minute test runs to determine the relative accuracy of the system.

- **Mercury CEMS testing Nalco Mobotec, Richmond, IN.** Provided technical support in conducting emissions testing using mercury CEMS and sorbent trap tubes Method 30B on the ESP inlet, outlet, and stack at a coal-fired power plant. Four 30B test runs were conducted each day for a six week period with the addition of CEMS monitoring during the last week of the project.

- **Source Emissions Testing, Mallinckrodt Chemical Company, St. Louis, Missouri.** Conducted several emissions testing projects, including emissions testing on batch processes and coal-fired boilers. This testing included sampling for criteria pollutants as well as air toxics. He also conducted emission testing to determine compliance with local regulatory requirements and for use in Title V permitting.

- **Emissions Testing, Saudi Arabian Fertilizer Company (SAFCO), Damman, Saudi Arabia.** Conducted an emissions testing project that included sampling the emissions from the fertilizer acid plant to determine the emission rates of sulfur dioxide and sulfuric acid mist.

- **Compliance Emissions Testing, Olin Corporation.** As the field team leader, he conducted the initial compliance emissions testing on a chrome plating operation to evaluate the efficiency of the current pollution control equipment.

- **Emission Report/Title V Permitting, DANA Corporation, Cape Girardeau, Missouri.** As the field team leader, he conducted a project to evaluate the emissions from several heat-treating operations. The testing was performed to develop emissions test data for use in the facility's annual emission report and for Title V permitting purposes.

- **Trial Burn, Shell Oil Company, Terratherm Division.** As project technician, Mr. Cusac conducted a trial burn project designed to evaluate the efficiency of an In Situ Thermal Desorption (STD) unit. Testing included sampling for dioxins and furans and PCBs over a 36-hour test burn. Conducted testing to a Federal TSCA permit for the ISTD unit.

- **Emissions Testing, Chemetco.** He conducted emissions testing on three copper furnaces to determine compliance with an EPA consent order and state regulations. The testing included sampling for particulate matter and lead. He also prepared and submitted a test plan for regulatory approval.

- **Emissions Testing, Monsanto Company, Multiple Sites.** He conducted emissions testing for plants in Missouri, Iowa, West Virginia, Alabama, and Illinois. He completed trial burns for BIF units, compliance testing for batch operations, emissions testing for engineering purposes and in-house engineering.

- **CEM Certifications, Lonestar Industries.** Conducted several CEM certifications for Lonestar, which operates a rotary kiln subject to the BIF regulations. He also performed annual relative accuracy audits on one CEM system designed to monitor carbon monoxide and oxygen.

- **CEM Certification, Chemical Lime.** Conducted a CEM certification for two rotary kilns and performed an annual relative accuracy audit on one CEM system designed to monitor nitrogen oxide and sulfur dioxide.

- **Compliance Testing, Ventura Foods.** As project technician, Mr. Cusac conducted the initial compliance testing on a gas-fired boiler to evaluate the emission rate of nitrogen oxide and carbon monoxide for permitting purposes.

- **Emissions Testing, Confidential Client.** Conducted emissions testing to determine the efficiency of scrubbers in the plant. Testing included sampling for nitrogen oxide, hydrogen fluorides and phosphate concentrations.

- **Compliance Emissions Testing, Zoltek Corporation.** As project technician, he conducted compliance emissions testing for hydrogen cyanide and nitrogen oxide on three different thermal oxidizers and a batch incinerator.

- **Emissions Testing, Arrow Terminal.** Conducted emissions testing for hydrogen chloride on a scrubber system used in rail-car-to-tanker-truck transfers.

- **Emissions Testing, Toyota.** Conducted several emissions tests for total hydrocarbons and ammonia concentrations to determine the efficiency of scrubbers used by the plant.

- **Monthly Monitoring Inspections, Slay.** As field team leader he conducted monthly monitoring inspections for leaks on barge and rail-car-to-storage- tank transfers of benzene. He also managed and prepared semi-annual reports for this project.

- **Quarterly Monitoring Inspections, Cahokia Marine, Cahokia, Illinois.** He conducted monitoring inspections for leaks on barge-to-storage-tank transfers of benzene. He also managed and prepared the semi-annual report.

- **Ambient Air Monitoring, Spirtas Wrecking Company, St. Louis, Missouri.** Managed and conducted ambient air monitoring during the demolition of contaminated buildings at a former DOE facility. He established an ambient air monitoring network around the building to be demolished and supervised operation of that network. He compiled and evaluated field data and laboratory results.

- **Ameren Services Company, Jefferson City, Missouri.** Field scientist for an ambient air monitoring project at the former MGP site in Jefferson City, Missouri. Mr. Cusac was responsible for the mobilization, setup and operation of a network of four ambient air monitoring stations established along the perimeter of the project site. The monitoring program included ambient air monitoring using real-time and time-integrated sampling methods designed to measure concentrations of PM_{10}, SVOCs and VOCs. The real-time monitoring for VOCs and PM_{10} was accomplished using an automated real-time sampling system designed to continuously monitor in real-time concentrations of VOCs and PM_{10}. The time-integrated monitoring was conducted using standard USEPA sampling methods over 72-hour sampling periods. Meteorological data was collected on site and used in the evaluation of the real-time and time-integrated sampling results. Mr. Cusac was responsible for the day-to-day operation of real-time and time-integrated air monitoring equipment, including the calibration and maintenance of the air monitoring equipment and on-site meteorological equipment. Mr. Cusac was also responsible for the collection of time-integrated air samples for laboratory analysis, coordination of sampling activities with the remediation contractor, and the reporting of daily air monitoring results.

PROFESSIONAL AFFILIATIONS

National Member Air and Waste Management
St. Louis Chapter Air and Waste Management Source Evaluation Society

ANDREW J. ANDERSON

ENVIRONMENTAL FIELD TECHNICIAN

Mr. Anderson has been an environmental technician in the Air Quality Group responsible for performing a wide variety of tasks ranging from ambient air monitoring to source emissions testing for over two years. His source emissions testing experience includes conducting sampling on emissions from cement kilns, industrial boilers, thermal oxidizers and a variety of other industrial sources. Mr. Anderson has also been responsible for conducting ambient air monitoring activities at manufactured gas plant remediation sites. Additionally, his background includes maintenance and calibration of air monitoring equipment as well as performance of wet chemistry type sample analysis.

SELECTED PROJECT EXPERIENCE

- **Holcim, CEM Certifications.** Assisted in conducting relative accuracy test audits and calibration error audits on two CEMS installed on a cement kiln. The testing included conducting relative accuracy testing on the oxygen analyzers installed at the kiln exit, and on the SO_2, NO_x, CO, O_2 and THC analyzers at the kiln stack location. Mr. Anderson was responsible for conducting the calibration error audit and assisting the sampling team with completion of the relative accuracy portion of the test program.
- **Chemical Lime, CEM Certification.** Conducted a CEM certification for two rotary kilns, and performed an annual relative accuracy audit on one CEM system designed to monitor nitrogen oxide and sulfur dioxide on a time-share basis between two kilns.
- **Anheuser-Busch, Boiler Testing, St. Louis, MO.** Field team member for an emission testing program designed to evaluate emissions from two coal-fired boilers at the Anheuser-Busch Brewery in St. Louis, MO. The emission testing was being conducted as part of the Boiler MACT, and was designed to evaluate emissions of particulate matter, hydrogen chloride and mercury. The emission testing was conducted during the burning of different coal types to evaluate the emission rates of each coal. Mr. Anderson assisted in the preparation, mobilization and sampling phases of this project.
- **Anheuser-Busch, Boiler Testing, St. Louis, MO.** Field team member for an emission testing program designed to demonstrate compliance with RACT compliance limits for three boilers regulated under this program. The testing included determination of NO_x and CO emissions during the burning of coal, natural gas and biogas. Mr. Anderson assisted in the preparation, mobilization and sampling phases of this project.
- **Anheuser-Busch Boiler Testing, St. Louis, MO.** Field team member for an emission testing program designed to demonstrate compliance with Part 75 Low Mass Emitter (LME) limits for one boiler regulated under this program. The testing included determination of NO_x and CO emissions during the burning of coal, natural gas and biogas. Mr. Anderson assisted in the preparation, mobilization and sampling phases of this project.

EDUCATION

High School Diploma – Alton Sr. High School, 2003

Associates Degree in Electrical Automation Technology, Ranken Technical College, St. Louis, MO, 2006

TRAINING/ CERTIFICATIONS

Qualified Source Testing Individual (QSTI) – Source Evaluation Society (SES)

OSHA 29 CFR 1910.120 initial 40-hour training and refresher course in Hazardous Materials/Waste Site Investigation

Qualified Observer of Visible Emissions (USEPA Method 9)

MSHA Part 46 24-Hour Training

40CFR Part 60 Appendix A

e-RAILSAFE System

Senior Leadership
Integrated Services
Personal Business Relationships

- **Anheuser-Busch, Boiler Testing, Houston, TX.** Field team member for an emission testing program designed to demonstrate compliance with RACT compliance limits for three boilers regulated under this program. The testing included determination of NO_x and CO emissions during the burning of coal, natural gas and biogas. Mr. Anderson assisted in the preparation, mobilization and sampling phases of this project

- **Radiac Abrasives, Emissions Testing, Salem, IL.** Field team member for conducting emissions testing on a thermal oxidizer designed to control emissions from an abrasive wheel manufacturing. He was responsible for mobilizing test equipment and assisting the field team in the collection of emissions samples.

- **Nestle Pet Care, Emissions Testing, Bloomfield, MO.** Mr. Anderson performed multiple Method 5 tests on a hammer mill. He was responsible for mobilizing test equipment and assisting the field team in the collection of Method 5 samples.

- **Bunge, Emissions Testing, Council Bluffs, IA.** Mr. Anderson performed multiple Method 5, Method 201a, and Method 202 tests on multiple sources. He was responsible for mobilizing test equipment and assisting the field team in the collection of Method 5, Method 201a, and Method 202 samples.

- **Nalco Mobotec, CEMS Testing, Richmond, IN.** Mr. Anderson participated in 30B and Mercury CEMS testing of the ESP inlet, outlet, and stack at a coal-fired power plant. Four test runs were conducted each day for a six week period with the addition of CEMS monitoring during the last week of the project. Mr. Anderson participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. In addition, Mr. Anderson was responsible for maintenance of all field equipment as well as data reporting at the end of each day.

- **ASA Asphalt, Advance, MO.** Mr. Anderson performed multiple Method 5 tests on a bag house. He was responsible for mobilizing test equipment and assisting the field team in the collection of Method 5 samples.

- **Buzzi Unicem, Cape Girardeau, MO.** Mr. Anderson performed Method 9 visual emissions testing on multiple conveyors.

- **American Commercial Lines Terminal in St. Louis, MO.** Mr. Anderson performed Method 9 visible emissions testing for multiple coal handling operations.

- **Ameren Services, Ambient Air Monitoring, Carlinville, IL.** Mr. Anderson participated in ambient air monitoring activities during the remediation of a former manufactured gas plant site in central Illinois. Mr. Anderson was responsible for assisting in the sitting of five ambient air monitoring stations, calibration, maintenance and media recovery. Mr. Anderson was responsible for downloading the monthly met data, and putting it on spreadsheets.

- **Veolia, Sauget, IL.** Mr. Anderson participated in multiple RATA testing of three incinerators, and a boiler in which moistures were taken. Mr. Anderson participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Mr. Anderson was also responsible for all field equipment maintenance.

- **Ameren Services, Ambient Air Monitoring, Hoopeston, IL.** Mr. Anderson participated in ambient air monitoring activities during the remediation of a former manufactured gas plant site in central Illinois. Mr. Anderson was responsible for assisting in the sitting of six ambient air monitoring stations, calibration, maintenance and operation of ambient air monitoring equipment. Mr. Anderson was responsible for downloading the monthly met data, and putting it on spreadsheets.

- **Ameren Services, Ambient Air Monitoring, Pana, IL.** Mr. Anderson participated in ambient air monitoring activities during the remediation of a former manufactured gas plant site in central Illinois. Mr. Anderson was responsible for assisting in the sitting of five ambient air monitoring stations, calibration, maintenance and media recovery. Mr. Anderson was responsible for downloading the monthly met data, and putting it on spreadsheets.

- **Ameren Services, Ambient Air Monitoring, Jacksonville, IL.** Mr. Anderson participated in ambient air monitoring activities during the remediation of a former manufactured gas plant site in central Illinois. Mr. Anderson was responsible for assisting in the sitting of five ambient air monitoring stations, calibration, maintenance and operation of the air monitoring stations. Mr. Anderson conducted real-time air monitoring using portable instrumentation to measure VOCs, dust and benzene. Mr. Anderson was responsible for downloading the monthly met data, and putting it on spreadsheets.

- **Ameren Services, Keokuk, IA.** Mr. Anderson assisted in the collection of soil vapor samples in a residential area near a former manufactured gas plant site in Iowa. Mr. Anderson was responsible for assisting in the purging of soil vapor probes and the collection of soil vapor samples.

- **Ameren Services, Ambient Air Monitoring, Keokuk, IA.** Mr. Anderson participated in ambient air monitoring activities during the remediation of a former manufactured gas plant site in central Iowa. Mr. Anderson was responsible for assisting in the sitting of five ambient air monitoring stations, calibration, maintenance and operation of the air monitoring stations. Mr. Anderson conducted real-time air monitoring using portable instrumentation to measure VOCs, dust and benzene. Mr. Anderson was responsible for downloading the monthly met data, and putting it on spreadsheets.

- **Nalco Mobotec, CEMS Testing, Cochise, AZ.** Mr. Anderson participated in 30B and Mercury CEMS testing of the ESP inlet and outlet of a coal-fired power plant. Four test runs were conducted each day for a two week period. Mr. Anderson participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. In addition, Mr. Anderson was responsible for maintenance of all field equipment as well as data reporting at the end of each day.

- **Veolia, Sauget, IL.** Mr. Anderson participated in USEPA Method 30B testing two incinerators. Numerous test runs were conducted each day based on results for a three day period. Mr. Anderson participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Mr. Anderson was also responsible for all field equipment maintenance.

- **Veolia Environmental Services, Sauget, IL.** Mr. Anderson participated in USEPA Method 30B and CEMS testing of two garbage incinerator units. Multiple test runs were conducted each day based on prior results. Mr. Anderson participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Mr. Anderson was also responsible for all field equipment maintenance.

- **Kansas City Power & Light, Kansas City, MO.** Mr. Anderson participated in USEPA ICR testing at four different test sites over a two month period. Testing methods included USEPA 10A, USEPA 316, USEPA 25A, USEPA 18, USEPA 0031, USEPA 0010, USEPA 26A, USEPA CTM 033, USEPA 7E, USEPA 6C, USEPA 30B, USEPA 29, USEPA OTM 27, USEPA OTM 28, USEPA 3A, USEPA 1, USEPA 2, and USEPA 4. Mr. Anderson participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project.

- **Westar, St. Mary's, KS.** Mr. Anderson participated in testing at a coal powered power plant to determine total particulate emissions. Several runs were conducted each day at different operating conditions. Testing methods included USEPA 5B and USEPA OTM 28. Mr. Anderson participated in preparation, mobilization, sampling, recovery, analysis, and demobilization phases of the project. Mr. Anderson was specifically responsible for recovery of samples as well as on-site analysis. Mr. Anderson was also responsible for all field equipment maintenance.

- **Kansas City Board of Public Utilities, Kansas City, KS.** Mr. Anderson participated in a RATA of a coal fired power plant. Testing methods to perform the RATA included USEPA 6C for SO_2, USEPA 7E for NO_x, USEPA 3A for O_2/CO_2, USEPA 1 for sampling point determination, USEPA 2 for stack flow velocity, and USEPA 4 for moisture determination. Mr. Anderson participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Testing was also performed on an incinerator for particulate matter using USEPA method 5. Mr. Anderson was also responsible for all field equipment maintenance.

- **Kansas City Power & Light, Kansas City, MO.** Mr. Anderson participated in testing to determine ammonia slip on a reactor unit at a coal fired power plant using USEPA method CTM 027. Mr. Anderson participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Mr. Anderson was also responsible for all field equipment maintenance.

- **30-Day NOx emissions testing, KCP&L, St. Joseph, MO.** Mr. Anderson helped in the setup and tear down on the project. Mr. Anderson conducted daily bias and equipment checks for Lake Road utility boiler.

- **Source emissions testing, Covidien, St. Louis, MO.** Mr. Anderson conducted emissions testing for Industrial Boiler MACT ICR letter project at Pharmaceutical manufacturer.

- **Source emissions testing, Buzzi Unicem, Cape Girardeau, MO.** Mr. Anderson participated in a CEM RATA and PM sampling for Portland cement kiln exhaust. Continuous Emission Monitoring (CEM) system designed to monitor Oxygen, Carbon Dioxide, flow, and moisture.

Senior Leadership
Integrated Services
Personal Business Relationships

- **Source emissions testing, Chemical Lime, New Martinsville, WV.** Mr. Anderson participated in multiple visible emissions test at the lime terminal.

- **CEM Certification, Chemical Lime.** Mr. Anderson participated in a CEM annual relative accuracy audit (RATA) for two rotary kilns. CEM system designed to monitor nitrogen oxide, sulfur dioxide, Oxygen, Carbon Dioxide, flow, and moisture. Utilized spherical 3D probe to determine stack gas velocities for flow RATA.

Nicholas A. Pichee

ENVIRONMENTAL FIELD TECHNICIAN

EDUCATION

High School Diploma – Alton Sr. High School, 2004

AS in Science Lewis & Clark Community College, 2008

TRAINING/ CERTIFICATIONS

Hazardous Waste Operations and Emergency Response (HAZWOPER) 40-Hour Training with current 8 hr. refresher

MSHA Part 46 24-Hour Training

Nuclear Gauge/Hazmat Certification

Qualified Observer of Visible Emissions (USEPA Method 9)

Mr. Pichee is an environmental technician in the Air Quality Group responsible for performing a wide variety of tasks ranging from ambient air monitoring to source emissions testing. His source emissions testing experience includes conducting sampling on emissions from cement kilns, industrial boilers, thermal oxidizers and a variety of other industrial sources. Mr. Pichee has also been responsible for conducting ambient air monitoring activities at manufactured gas plant remediation sites. Additionally, his background includes maintenance and calibration of air monitoring equipment as well as performance of wet chemistry type sample analysis.

SELECTED PROJECT EXPERIENCE

- **Buzzi Unicem, CEM Certifications, Cape Girardeau, MO.** Field team member that assisted in conducting a relative accuracy test audit on O_2 CEMS at the Buzzi Unicem facility in Cape Girardeau, Missouri. The project included conducting nine, 21-minute test runs to determine the relative accuracy of the O_2 system. Mr. Pichee was responsible for mobilizing the test equipment, setting up the test equipment and assisting the sampling team with completion of the relative accuracy test program.

- **Radiac Abrasives, Emissions Testing, Salem, IL.** Provided technical support in conducting emissions testing on a thermal oxidizer designed to control emissions from an abrasive wheel manufacturer. Mr. Pichee was responsible for mobilizing test equipment and assisting the field team in the collection of emissions samples.

- **Ameren Services, Ambient Air Monitoring, Hoopeston, IL.** Mr. Pichee participated in ambient air monitoring activities during the remediation of a former manufactured gas plant site in central Illinois. Mr. Pichee was responsible for assisting in the siting of six ambient air monitoring stations, calibration, maintenance and operation of ambient air monitoring equipment. Mr. Pichee was also active in data validation for this project. In addition, Mr. Pichee was responsible for downloading and preparing monthly weather data reports. Mr. Pichee also participated in the demobilization from the site.

- **Ameren Services, Ambient Air Monitoring, Pana, IL.** Mr. Pichee participated in ambient air monitoring activities during the remediation of a former manufactured gas plant site in central Illinois. Mr. Pichee was responsible for assisting in the siting of five ambient air monitoring stations, calibration, maintenance and media recovery.

- **Ameren Services, Ambient Air Monitoring, Jacksonville, IL.** Mr. Pichee participated in ambient air monitoring activities during the remediation of a former manufactured gas plant site in central Illinois. Mr. Pichee was responsible for assisting in the siting of five ambient air monitoring stations, calibration, maintenance and operation of the air monitoring stations. Mr. Pichee conducted real-time air monitoring using portable instrumentation to measure VOCs, dust and benzene. Mr. Pichee was also active in data validation for this project. In addition, Mr. Pichee was responsible for downloading and preparing monthly weather data reports.

- **Nestle, Emissions Testing, Jacksonville, IL.** Mr. Pichee participated in emissions testing on multiple sources aimed at evaluating particulate matter using USEPA Test Method 5. Mr. Pichee assisted in the preparation, mobilization, sampling, recovery, and demobilization phases of the project.

- **Nestle Pet Food Engineering, Emissions Testing, St. Louis, MO.** Mr. Pichee participated in emissions testing for propylene glycol and particulate matter on a single source using USEPA Test Method 5. Mr. Pichee assisted in the preparation, mobilization, sampling, recovery, and demobilizing phases of the project.

- **Nalco Mobotec, CEMS Testing, Richmond, IN.** Mr. Pichee participated in Method 30B and Mercury CEMS testing of the ESP inlet, outlet, and stack at a coal-fired power plant. Four test runs were conducted each day for a six week period with the addition of CEMS monitoring during the last week of the project. Mr. Pichee participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. In addition, Mr. Pichee was responsible for maintenance of all field equipment, as well as data reporting at the end of each day.

- **Bunge, Council Bluffs, IA.** Mr. Pichee was responsible for laboratory analysis of USEPA Test Method 5 and Test Method 201A and 202 Samples.

- **Nalco Mobotec, CEMS Testing, Cochise, AZ.** Mr. Pichee participated in Method 30B and Mercury CEMS testing of the ESP inlet and outlet of a coal-fired power plant. Four test runs were conducted each day for a two week period. Mr. Pichee participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. In addition, Mr. Pichee was responsible for maintenance of all field equipment, as well as data reporting at the end of each day.

- **Westar, St. Mary's KS.** Mr. Pichee participated in USEPA Method 5B sampling at a coal-fired power plant. Six test runs were conducted each day for a three day period. Mr. Pichee participated in the preparation, mobilization, sampling, recovery, analysis, and demobilization phases of the project. Mr. Pichee was specifically responsible for on-site analysis and timely recording and reporting of data to the appropriate individuals.

- **Veolia Environmental Services, Sauget, IL.** Mr. Pichee participated in USEPA Method 30B testing of a garbage incinerator. Numerous test runs were conducted each day based on results for a three day period. Mr. Pichee participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Mr. Pichee was also responsible for all field equipment maintenance.

- **Veolia Environmental Services, Sauget, IL.** Mr. Pichee participated in USEPA Method 30B and CEMS testing of two garbage incinerator units. Multiple test runs were conducted each day based on prior results. Mr. Pichee participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Mr. Pichee was also responsible for all field equipment maintenance.

- **Kansas City Power & Light, Kansas City, MO.** Mr. Pichee participated in USEPA ICR testing at four different test sites over a two month period.

Testing methods included USEPA 10A, USEPA 316, USEPA 25A, USEPA 18, USEPA 0031, USEPA 0010, USEPA 26A, USEPA CTM 033, USEPA 7E, USEPA 6C, USEPA 30B, USEPA 29, USEPA OTM 27, USEPA OTM 28, USEPA 3A, USEPA 1, USEPA 2, and USEPA 4. Mr. Pichee participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Mr. Pichee was specifically responsible for the operation of the USEPA method 30B sampling train and on-site analysis of the samples. Mr. Pichee was also responsible for all field equipment maintenance.

- **Westar, St. Mary's, KS.** Mr. Pichee participated in testing at a coal powered power plant to determine total particulate emissions. Several runs were conducted each day at different operating conditions. Testing methods included USEPA 5B and USEPA OTM 28. Mr. Pichee participated in preparation, mobilization, sampling, recovery, analysis, and demobilization phases of the project. Mr. Pichee was specifically responsible for recovery of samples as well as on-site analysis. Mr. Pichee was also responsible for all field equipment maintenance.

- **Kansas City Board of Public Utilities, Kansas City, KS.** Mr. Pichee participated in a RATA of a coal fired power plant. Testing methods to perform the RATA included USEPA 6C for SO_2, USEPA 7E for NO_x, USEPA 3A for O_2/CO_2, USEPA 1 for sampling point determination, USEPA 2 for stack flow velocity, and USEPA 4 for moisture determination. Mr. Pichee participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Testing was also performed on an incinerator for particulate matter using USEPA method 5. Mr. Pichee was specifically responsible for the sampling, recovery, and analysis portions of this phase of the project. Mr. Pichee was also responsible for all field equipment maintenance.

- **Kansas City Power & Light, Kansas City, MO.** Mr. Pichee participated in testing to determine ammonia slip on a reactor unit at a coal fired power plant using USEPA method CTM 027. Mr. Pichee participated in the preparation, mobilization, sampling, recovery, and demobilization phases of the project. Mr. Pichee was also responsible for all field equipment maintenance.